SOCIO-ECONOMIC SURVEY
OF
SMALLHOLDER FARMING SYSTEMS IN SOLOMON ISLANDS

LATA
TEMOTU PROVINCE

Agricultural Economics Section
Rural Services Project
Ministry of Agriculture and Lands
Solomon Islands

June 1989

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Abbreviations and Units of Measure

AES	Agricultural Economics Section (RSP)
CEMA	Commodities Exporting and Marketing Authority
DCRS	Dodo Creek Research Station
LDA	Livestock Development Authority
MAL	Ministry of Agriculture and Lands
PBME	Project Beneficiary Monitoring and Evaluation (RSP)
RDC	Rural Development Centre (RSP)
RSP	Rural Services Project
km	kilometre = 1,000 m
ha	hectare = 10,000 sq m
m	metre
MT	metric tonne = 1,000 kg
SI$	Solomon Islands Dollar

Acknowledgements

The present report is produced by the staff of the Agricultural Economics Section. The Section was established under the ADB/IDA/IFAD assisted Rural Services Project and is engaged in a two years socio-economic study of smallholder farming systems throughout Solomon Islands, extending from 1987 to 1989.

Many others contributed to the planning of the programme and in its implementation. The study would not have been possible without the support and patience of local people. To them we are grateful and hope that the present report will be in some way of benefit.

We would like to thank members of the Ministry of Agriculture and Lands, in particular the Director of the Rural Services Project and staff, and the Chief Research Officer and staff for their support throughout.

The Statistics Office of the Ministry of Finance has assisted the survey through the generous lending of equipment, canoes and outboards, and in sampling. Thanks are especially due to Richard Harris, Rural Statistician, for his interest in the survey from the outset.

Not least, thanks are extended to the Premier of Temotu Province, the Provincial Secretary and staff, the Principal Field Officer and members of the agricultural extension service for their support in establishing the survey. It is especially hoped that the present report will find a practical application in development works being undertaken in the Province.

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Agricultural Economics Section
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Solomon Islands

Chapter: 1
INTRODUCTION

1.1 The Solomon Islands comprise a double chain of islands extending in a north-west south-east direction over 860km of the south-west Pacific between latitudes 5°-12°S and longitudes 155°-170°E. The islands lie directly along a major line of crustal weakness traversing the western Pacific and are the surface expressions of fault-bounded blocks and troughs originating in a zone of geologically intense activity. Warping and block movement are the most significant geomorphic processes responsible for the elevation of land to its present altitude, with marine sediments occuring on some of the highest ranges. Such processes continue spasmodically and raised reefs at various heights occur in many parts of the country, as does intense faulting. Earthquakes are frequent and often initiate land movements in ground already close to shearing point such as saturated soil at the heads of steeply incised gullies, resulting in debris slides among the high ridges (10).

1.2 Solomon Islands lies well within the geographical tropics in an oceanic area where two contrasting trade winds meet, a low-pressure belt of ascending air known as the "inter-tropical convergence zone" (ITCZ). In this zone warm and humid air masses drawn from equatorial regions meet relatively cool and dry sub-tropical air derived from the south-east. From about March to November the islands experience steady, shallow, south-easterly winds. During November and December unsettled weather is likely as the ITCZ moves south over the islands, from which follows steady north-westerly winds. March and April are again unsettled as the ITCZ returns northwards until the south-easterly trade winds become re-established. Cyclonic disturbances may be generated, particularly around December and April when the convergence of the two air streams is strongest. Weather is varied, both temporally and spatially, but is characterised by continally high average temperatures and humitity. Most land areas have a mean annual rainfall of 3,000-5,000mm with variations depending on latitude and orientation to prevailing winds. Temperatures are more uniform, at around 26°C in the lowlands, and never reach extremes which would restrict plant growth. Night time humidity exceeds 90%. This may fall to 60% on clear sunny days, or remain close to saturation point during cyclonic conditions (10).

1.3 The islands are rugged, with a predominance of ridge-valley landscapes and high relief. Undulating rolling landscapes have a limited distribution and extensive fluvial plains are uncommon. Chemical weathering is intense under conditions of continuously high temperature and moisture, however, soil depths are not generally great. Most hill areas have slopes exceeding 12-15° and commonly reach 35-55° among the mountain ridges. Continual soil wash and creep and periodic mass movements effectively keep pace with rock weathering. Only on stable flatter sites do deep profiles develop. The islands for the most part are covered in dense forest, some fire disclimax grassland in parts of Guadalcanal and Florida Islands, and land cleared or cultivated (10).

1.4 The population of Solomon Islands from the 1986 census was **285,176**, with an annual growth rate of 3.5%. The land area of **28,370sq km** gives a low overall population density of **10** persons per sq km. Settlements are mostly along the coastal margins so that in some parts of the country population densities are high.

1.5 The population distribution of Solomon Islands is summarised in diagram 1.1 and key socio-economic data are presented in table 1.1

1.6 There is a considerable variation between land area and population among the provinces. While Western Province accounts for 33% of the national land area it contains only 19% of the population. The West is characterised by low population density compared to provinces such as Central, Malaita and Temotu. Although Temotu contains 5% of the national population it also accounts for only 3% of the national land area, and therefore has a relatively high mean population density. Land area in Solomon Islands is summarised in diagram 1.2.

Table: 1.1
SOLOMON ISLANDS KEY DATA

Province	Western	Ysabel	Central	Guadalcanal	Honiara
POPULATION					
1986 population	55,250	14,616	18,457	49,831	30,413
annual growth rate	3.0	3.2	2.9	4.3	6.8
% national population	19	5	6	17	11
peri-urban population	3,710	1,901	1,622		30,413
% peri-urban	7	13	9	38	
number of households	7,942	2,362	3,079	8,072	4,317
LAND AREA					
land area (sq km)	9,312	4,136	1,286	5,336	22
% land area	33	15	5	19	0
population density/sq km	6	4	14	9	1,382
1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SIS'000)					
revenue	443	173	191	281	1,033
grants	2,556	634	623	1,247	704
current expenditure	3,504	849	750	1,431	1,561
capital expenditure	200	58	88	192	177
net revenue (negative)	(705)	(100)	(24)	(96)	(2)

Province	Malaita	Makira	Temotu	Total
POPULATION				
1986 population	80,032	21,796	14,781	285,176
annual growth rate	2.7	3.6	2.8	3.5
% national population	28	8	5	100
peri-urban population	3,252	2,588	1,295	44,781
% peri-urban	4	12	9	16
number of households	12,417	3,278	2,375	43,842
LAND AREA				
land area (sq km)	4,225	3,188	865	28,370
% land area	15	11	3	100
population density/sq km	19	7	17	10
1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SIS'000)				
revenue	339	485	160	3,103
grants	1,891	1,095	445	9,195
current expenditure	2,190	1,472	615	12,371
capital expenditure	331	600	0	1,646
net revenue (negative)	(291)	(492)	(10)	(1,719)

Source: Statistics Office Statistical Bulletin 15/87 "Provincial Statistics"
Populationa data revised from Statistics Office Statistical Bulletin 3/88 "Solomon Islands Population Census"

POPULATION COMPOSITION

% by province

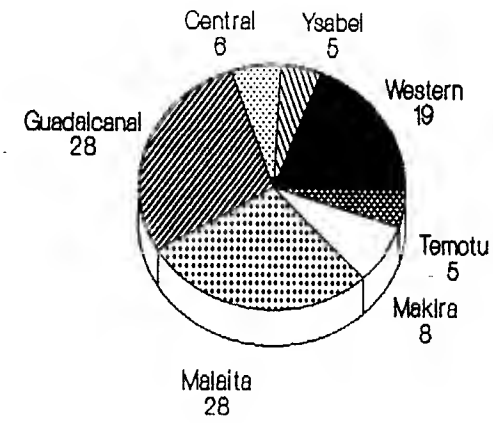


Diagram: 1.1

LAND AREA

% by province

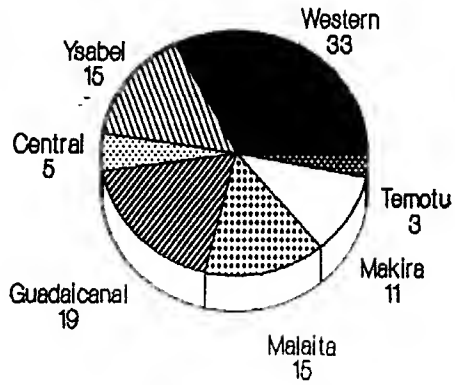


Diagram: 1.2

1.7 While a provincial comparison presents a broad indication of population densities throughout the country, differences within provinces are of significance to agricultural policy. With improvements in communications and administrative links there has been a general migration to the coastal margins where travel and marketing are easier, and where services such as schooling and health are more readily available. The highland interior tends to be sparsely populated in comparison.

1.8 While the overall population density is low, in some areas a growing population pressure is causing concern. Traditional farming systems based on forest fallow may be sustained under conditions of low pressure, but run into soil fertility and related problems when fallow periods are reduced and cropping intensified. Conversely, there are sparsely populated areas of agricultural potential where communications and services are poorly developed. The Rural Services Project is developing facilities in areas of high agricultural potential, providing marketing and transport infrastructure, agricultural and training services, and extending the coverage of adaptive research. These provide new opportunities for agricultural development.

1.9 The capacity of government to implement development programmes is to a large extent determined by funds and resources available. Diagram 1.3 summarises provincial government revenue and expenditure in 1987. Nationally there was a deficit of SI$1.7 million arising through over expenditure in all provinces. Provincial finance is characterised by a low revenue earning capacity, being nationally about one third of the level of central government grants. Revenue and grants are expended almost entirely on basic operating costs, although these remain severely constrained and under-funded. There are little or no funds for development, and investment amounted to only 12% of total expenditure in 1987.

1.10 Agriculture accounted for 42% of export earnings in 1985[11], although this has dropped from the much higher level of 87% in 1960. It is the major employment activity in the country and the source of livelihood for the majority of the population.

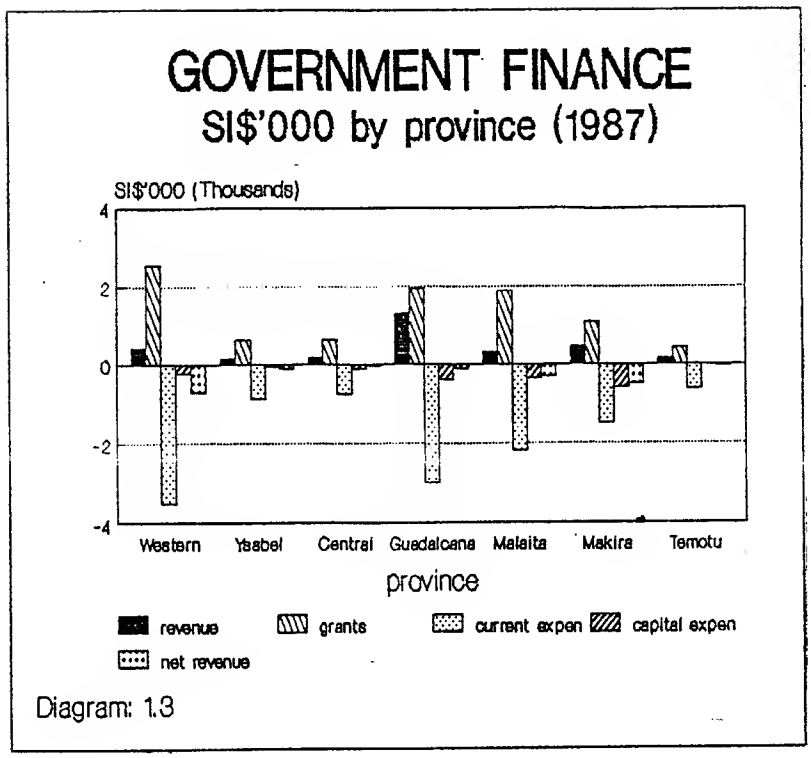


Diagram: 1.3

1.11 Despite various studies undertaken in the past, there is little hard socio-economic data on smallholder farming systems which would assist agricultural policy makers, trainers, extension workers and researchers in the planning, implementation and evaluation of development activities. A national sample survey of agriculture was conducted in 1974-75 [5], but these data are are no longer able to satisfy information requirements.

1.12 The Agricultural Economics Section (AES) was established under the Rural Services Project (RSP) inter alia in order to generate statistical information on smallholder production systems for the quantification of constraints to agricultural development and the devising of appropriate agricultural research programmes. The present study is part of a national survey programme to generate detailed base-line data on smallholder farming systems.

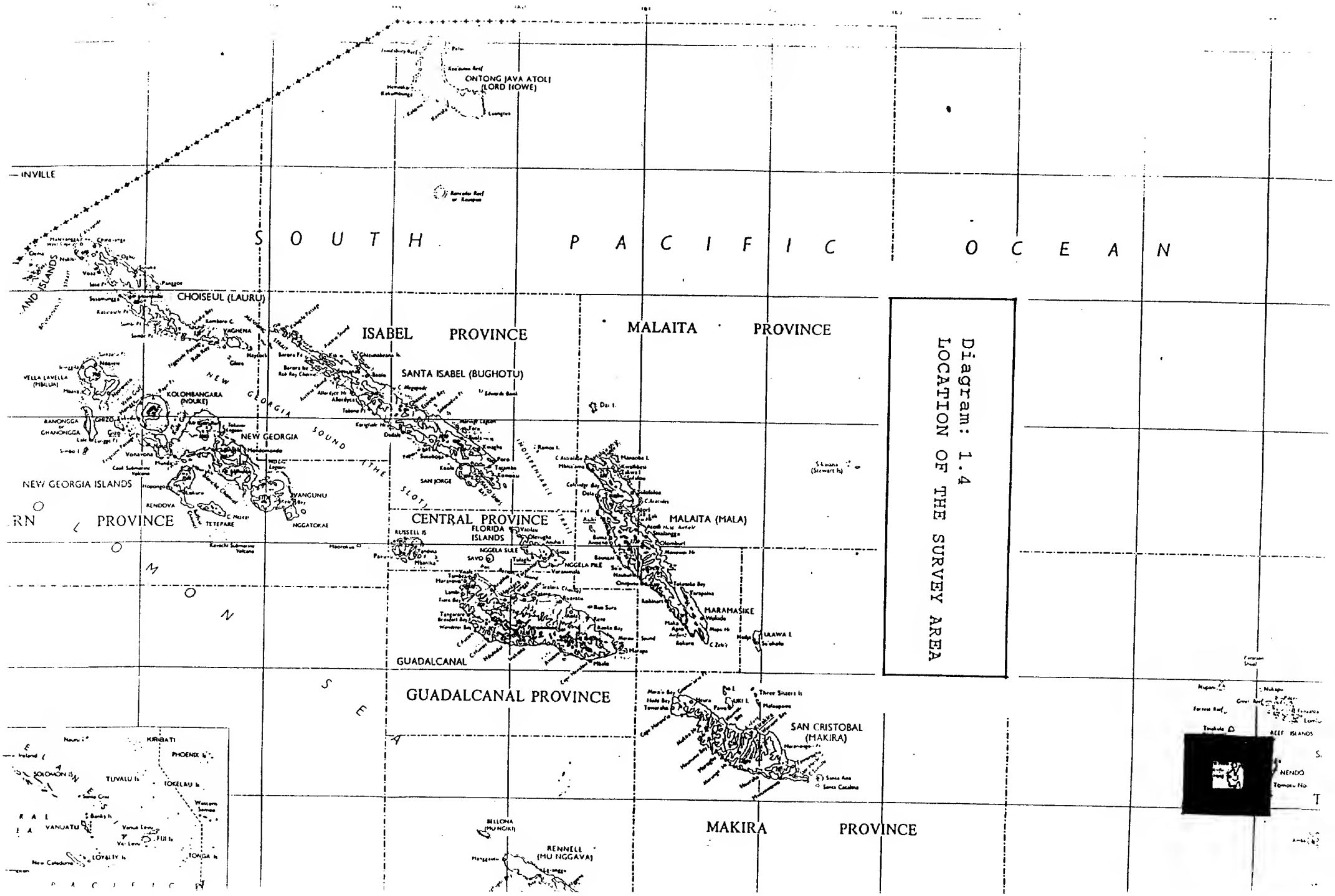
1.13 Since September 1987 AES has conducted a series of farming systems surveys in selected sites throughout the country, such as in the immediate areas of influence of Rural Development Centres or in other areas of special agricultural interest. It is intended that the findings of the survey will find application in the evaluation of development activities, and will assist in the assessment of changes taking place in Solomon Islands agriculture and the formulation of development strategies. The background and justification for the survey programme are documented in the AES Inception Report of 1987 [20]. Methodologies are described in the Agricultural Economics Field Survey Manual [21] and related documents produced by AES.

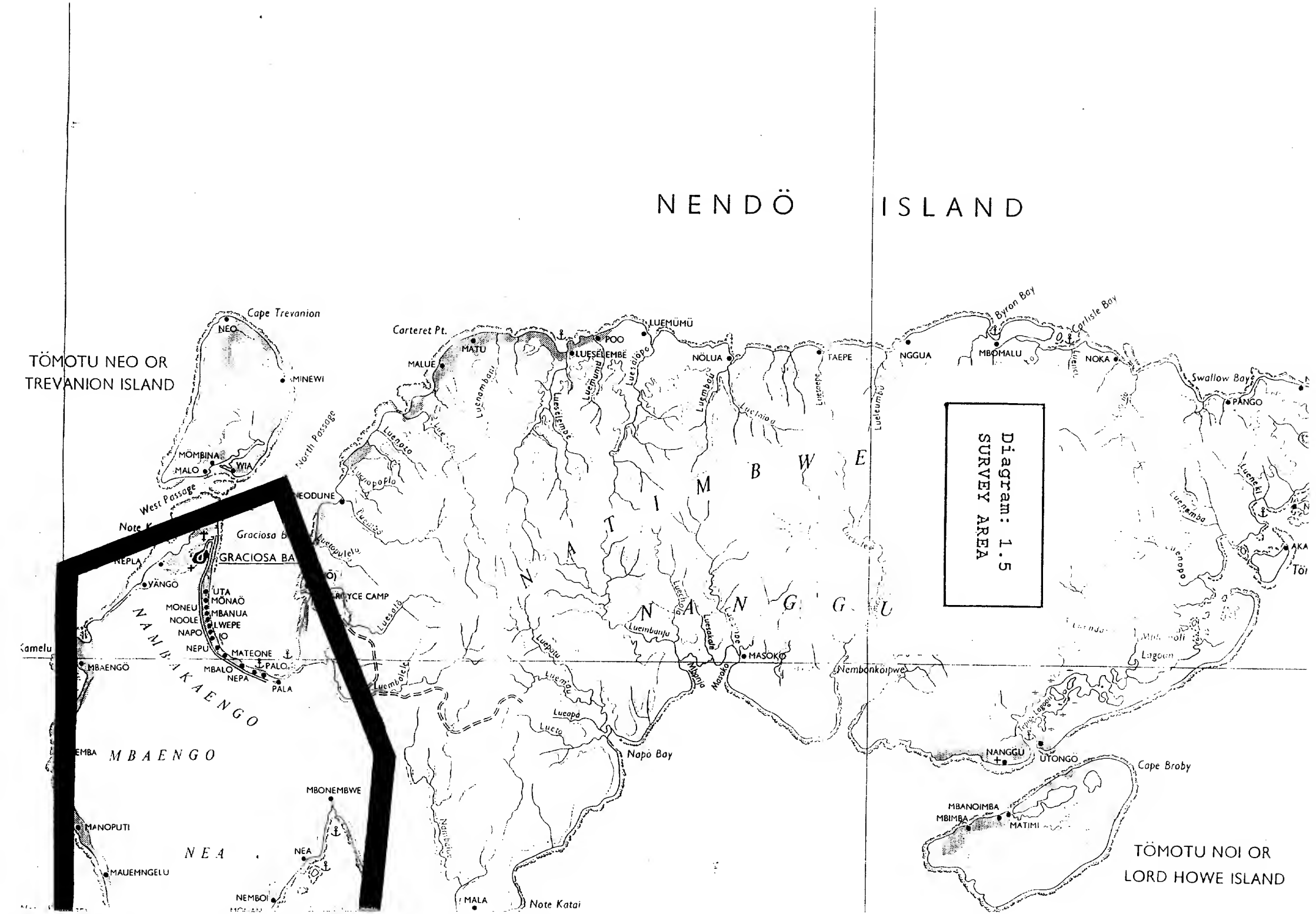
1.14 The Lata survey in Temotu Province was conducted among the coastal villages of Graciosa Bay to the north and Nemya Bay to the south of Nendo island, and is in the vicinity of the Rural Development Centre and Field Experimental Station at Lata. Field work was conducted from March to June 1988 and covered a sample of 40 rural households. Two stage systematic random sampling was guided by the Statistics Office based on equal probability of household selection, with accessibility taken into account in the definition of the sample frame. Villages were listed from the 1986 population census and selected by systematic random sampling. A pre-determined number of households within each village (or cluster of small villages) were then selected by simple random sampling. Maps of the survey area are presented in diagrams 1.4 and 1.5.

1.15 The survey is designed to investigate the structure and dynamics of smallholder crop and management systems. Of particular importance in the socio-economics of smallholder agriculture is the allocation of labour, since few cash inputs are applied and little wage labour is employed.

1.16 All cultivated areas, including cropped and cleared land, are measured by tape and compass to an error tolerance of 5%. Crop areas are computed and checked in the field by programmable calculator. Data are processed in "dBASE III Plus" databases and analysed through "SPSS/PC+". Raw output is transferred to "Lotus 123 vr 2" spreadsheets for tabulation and secondary processing. Text tables are incorporated into "Wordstar Professional r 4" and graphics are edited in "Harvard Presentation Graphics".

1.17 The Agricultural Economics Programme is sponsored under the Rural Services Project of the Ministry of Agriculture and Lands which is co-financed by the Government of Solomon Islands and ADB/IDA/IFAD. Data processing and the presentation of results has been made possible by the generosity of the Government of New Zealand through its Miscellaneous Technical Assistance Programme. This has overcome a primary constraint to work of this kind in the Ministry of Agriculture and Lands through the provision of computing hardware.


ONTONG JAVA ATOLL
(LORD HOWE)
SOUTH PACIFIC OCEAN
CHOISEUL (LAURU)
ISABEL PROVINCE
MALAITA PROVINCE
SANTA ISABEL (BUGHOTU)
KOLOMBANGARA
(NDUKE)
NEW GEORGIA
NEW GEORGIA ISLANDS
CENTRAL PROVINCE
FLORIDA ISLANDS
MALAITA (MALA)
MARAMASIKE
ULAWA I.
GUADALCANAL
GUADALCANAL PROVINCE
SAN CRISTOBAL
(MAKIRA)
MAKIRA PROVINCE
RENNELL
(MU NGGAVA)
BELLONA
(MUNGIKI)
Diagram: 1.4
LOCATION OF THE SURVEY AREA


NENDÖ ISLAND
TÖMOTU NEO OR TREVANION ISLAND
TÖMOTU NOI OR LORD HOWE ISLAND
Diagram: 1.5
SURVEY AREA
Cape Trevanion
NEO
MINEWI
MÖMBINA
MALO
WIA
North Passage
West Passage
Carteret Pt.
MAJU
MALUE
LUEMÜMÜ
POO
LUESELEMBE
NÖLUA
TAEPE
NGGUA
Byron Bay
MBOMALU
Carlisle Bay
NOKA
Swallow Bay
PANGO
Graciosa B
GRACIOSA BA
NEPLA
YANGO
UTA
MONAÖ
MONEU
NOOLE
MBANUA
LWEPE
NAPO
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MBAENGO
MBONEMBWE
MANOPUTI
NEA
NEA
MAUEMNGELU
NEMBOI
MALA
Note Katai
Napo Bay
MASOKO
Nembonkoipwe
Lagoon
NANGGU
UTONGO
Cape Broby
MBANOIMBA
MBIMBA
MATIMI
NATIMBWE
NANGGU

Chapter: 2
SUMMARY AND MAIN FINDINGS

Household Composition

2.1 The mean household size in the survey area is **5.40**, comprised of **2.66** males to **2.74** females, a ratio of **1:1.03** males to females.

2.2 In the sample of 40 households the available labour composition of rural households in the survey area is **46%** male and **54%** female, a ratio of **1.41male:1.67female** out of a total of 3.08 adult equivalent labour units per household.

Income Earning Activities

2.3 Agricultural income earning activities in the survey area are mainly the sale of food crops, fishing and the sale of coconuts and copra. **73%** of sampled households earn income from food crop sales, 13% earn income from minor cash crops, and **8%** from livestock sales. 38% of households earn income from fishing, mainly from the sale of fish and to a minor extent from shellfish and crabs.

2.4 **38%** of households earn income from copra and **23%** of households earn income from fresh coconuts.

2.5 13 of households earn income from a profession. **30%** of sampled households earn income from private shops and crafts and **28%** of households earn income from cooperative shops. **5%** of households have a skilled trade.

Extension and Mass Media

2.6 **47%** of households listen to agricultural programmes on the radio. Simple written materials may be appropriate in extension since **80%** of households have at least one member with some reading and writing ability.

2.7 Only 6% of households are visited by agricultural extension workers, whether government or non-government, at least once per year, and 7% of farmers have attended a training course or village meeting.

Livestock

2.8 There is a very low level of commercialism in livestock management where the most important livestock are pigs and chickens. No sampled farmer has cattle.

2.9 50% of farmers keep pigs with a mean herd size of 1.90 among owners. Chickens are kept by 38% of households with a mean flock size of 7.13 among owners.

Holding Size Distribution

2.10 The mean holding size in terms of area cultivated is 0.710ha but the holding size distribution is moderately skewed in that 61% of farmers have holdings of less than 0.5ha.

2.11 Inequality in holding size is largely due to a high proportion of farmers with very small holdings without coconuts. Tree crop holdings tend to be larger than non-tree cropping holdings, with a mean size of 1.226ha and represent 53% of farmers. Conversely non-tree cropping farmers have a mean holding size of 0.137ha and represent 47% of sampled farmers.

2.12 Two out of 40 sampled households have no cultivated land while one of the remaining 38 has no food garden. 97 % of farmers grow traditional subsistence or food crops, where the area cultivated to these crops is fairly uniform among all farmers. The mean food crop area is 0.142ha and the mean tree crop area is 1.087ha.

Labour Density

2.13 The mean labour availability is 3.13 adult equivalent labour units per farming household, resulting in a mean labour density of 4.41 labour units per hectare. There is no apparent association between labour availability and holding size but labour density per unit area falls rapidly from 26.69 labour units per hectare on holdings of less than 0.25ha in size to 1.30 labour units per hectare on holdings of 2.5 - 3ha in size. On non-tree cropping holdings the mean labour density is 20.57 labour units per hectare compared with 2.79 labour units per hectare on tree-crop holdings. Land availability, rather than labour availability, is the major limitation.

Cropping Patterns

2.14 The average holding size is 0.71ha, however, a distinction is made between farmers with tree crops and those with no tree crops. Of households with tree crops the mean holding size is 1.23ha, of which 1.09ha is under tree crops and 0.14ha is food crops. In contrast non-tree crop farmers have a mean holding size of 0.14ha under food crops. Despite the small size of holdings smallholder cropping patterns are complex and diverse, with 10 dominant crops recorded and a total of 50 distinct mixtures.

Coconuts and Cocoa

2.15 There is no occurence of cocoa in the survey area. Maintenance standards on coconuts are high, with most plots brushed at least to shoulder height. 4% of plots undercropped (ie new plantings in food gardens), 63% are brushed to ground level, 29% are brushed to shoulder height and only 4% have a ground cover of secondary bush.

2.16 In the survey the coconut variety is mainly local tall although 7% are Rennel palms. 18% are up to eight years of age, 11% are 9-16 years and 71% are 17-40 years of age.

Fallow

2.17 Fallow in Solomon Islands farming systems is necessary for the maintenance of soil fertility, particularly for the replenishment of potassium in ash following burning. Shifting cultivation has other valuable characteristics, not least its phytosanitary qualities. The fallow period is an indicator of land pressure, and possible fertility and pest problems associated with intensive cultivation. On food gardens where it is known, there is a fallow period of 2.8 years, but **90%** have a fallow longer than memory. Root crops are typically grown over 2 to 3 harvests before reverting to fallow.

2.18 **94%** of all gardens have a fallow of primary or secondary forest extending essentially over the entire the cultivated area.

2.19 **42%** of the current food garden area was cut from primary forest compared with **95%** of the tree crop area.

Landform

2.20 There is a shortage of land for cultivation in the coastal lowlands, resulting in small holding sizes. **52%** of tree crop gardens representing **41%** of the tree garden area are on lowland sites. **18%** of food crop gardens representing **21%** of the food garden area are on lowland sites. Other gardens on the upland plateau.

2.21 Gardens for the most part are on flat sites and no conservation measures or alley cropping are practiced.

2.22 The mean distance of gardens from households is **.947** hours, with a maximum recorded distance of **3.00** hours.

Adverse Factors Affecting Production

2.23 65% of gardens representing 38% of the cultivated area have no apparent site limitations. Poor soil and site facrors are regarded as constraints on 6% of gardens (6% of area); pests and disease are a problem on 20% of gardens (48% of area); weeds are a problem on 5% of gardens affecting 24% of the cultivated area.

Crop Yields

2.24 Production data from the farming systems survey need to be reinforced with further yield studies to be undertaken by AES in 1989 and beyond. Indicative yields derived from secondary sources are presented in chapter 14.

2.25 In the survey the following yields were obtained:

Yield data from the farming systems survey

	# obs	kg/ha	
Copra	19	715	
Sweet Potato	1	1,081	
Taro - Hong Kong	1	30,357	(8.5kg on 2.78sq m)
Pana	5	6,280	

Labour

2.26 The dominant constraints are on tree crops. A labour shortage and a shortage of inputs or cash are recorded on **19%** of the tree crop area. In contrast food crop gardens do not have a shortage of labour or inputs. High distances of gardens from households were recorded in chapter 12 and consequently distance of gardens from households is a problem affecting **65%** of the tree garden area and **50%** of the food garden area.

2.27 Labour expenditure on the average holding is summarised in table 2.1 - presented firstly by crop (aggregating all operations), and secondly by operation (aggregating all crops).

Table: 2.1
SUMMARY OF LABOUR INPUT

	⟨------ work days per year -----⟩					⟨- % contribution -⟩			labour
	⟨----- per holding -----⟩				per ha				cost
	men	women	paid	total	average	men	women	paid	($IS)
i) By Crop									
Coconut	204	147	4	355		57	41	1	19
Cabbage					405				
Banana					74				
Nut trees	2	2		4	1100	50	50		
Sweet Potato	80	214		294	5865	27	73		
Taro	15	24		39	1928	38	62		
Yam	10	20		30	1718	33	67		
Pana	20	52		72	1791	28	72		
All Crops	331	459	4	794		42	58	1	19
ii) By Operation									
Land Clearance	90	106	3	199		45	53	2	17
Cultivation	23	20		43		53	47		
Planting	57	93	1	151		38	62	1	2
Tree Crops Establishment									
Tree Crops Maintenance	22	6		28		79	21		
First Weeding	57	64		121		47	53		
Second Weeding	11	12		23		48	52		
Third Weeding									
Harvesting	71	158		229		31	69		
All Operations	331	459	4	794		42	58	1	19
Available labour units	:1.41	1.67							
Days per unit labour	: 235	275	4						

2.28 Overall men provide **42%** of labour and women provide **58%**, with 1% of farm labour accounted for by hired labour. There are **794** work days per year required on an "average" holding of which 331 are provided by men, **459** by women and **4** by hired labour. The average adult man in the household spends 235 days working on the holding and the average adult woman spends 275 days.

2.29 Coconut accounts for **45%** of the holding labour budget. Sweet potato accounts for **37%**, taro **5%**, yam **4%** and pana **9%**. Men and women share most operations. Of the annual labour budget of **794** days, land clearance accounts for **25%** of labour expended, cultivation accounts for **5%**, planting **19%**, establishment and maintenance **4%**, weeding or brushing **18%** and harvesting **29%**.

Cash Crop Processing

2.30 The labour composition in the manufacture of copra is **92%** family and **8%** hired at an annual cash cost of **SI$8.8**. Hired labour is employed mainly in collecting, splitting and transporting of nuts while all operations are performed by family labour.

2.31 Copra manufacture requires **126** work days per annum to produce **963kg** copra, or one work day per **8kg** copra produced. **59** work days are spent on picking and shelling the nuts which account for **47%** of the total production time. Firewood collection takes **43** days or **34%** of the time; and drying, bagging and transport take **24** days or **19%** of the time.

2.32 The gross margin for copra production is summarised in table 18.2. From an annual production of **963kg** valued at the prevailing price of 33 cents per kilo the gross return is **SI$318**. Inputs costs from bags and twine amount to **SI$14.28** and labour costs are **SI$8.80**. The net income is **SI$295** which, at a requirement of **116** household labour days, represents a net return to labour of **SI$2.54** per household work day.

2.33 No cocoa production was undertaken by sampled farmers.

Marketing

2.34 Sale volumes and prices are generally low to average. Local market prices from Lata are listed below:

Local Market Prices in Lata on 25 May 1988

Commodity	price (SI$/kg)	
Coconut - Green	.33	
- Dry	.08	
Sweet Potato	.29	.31
Pana	.25	.32
Yam	.20	.23
Taro - Hong Kong	.29	
Banana - Cooking	.25	
- Sweet	.17	
Pineapple	.19	
Sugar Cane	.11	
Cabbage - Hibiscus	.15	
Long Bean	1.00	
Wing Bean	0.40	
Cucumber	0.15	
Pumpkin	0.20	
Betel Nut	.50	
Ngali Nut	.50	
Peanut	4.00	

2.35 Marketing problems mostly slight, but terrain and distance, labour shortage, low prices, lack of transport and risk of not selling enough are all problems.

Chapter: 3
HOUSEHOLD COMPOSITION

3.1 The analysis of household composition in the farming systems survey is to set production and management information in a social context and to establish labour availability. New demographic data are becoming available from the 1986 census and these provide background to survey results. Table 3.1 summarises some early results of the census[1].

Table: 3.1
POPULATION CHARACTERISTICS
(from the 1986 census)

Province	Western	Ysabel	Central	Guadal	Honiara	Malaita	Makira	Temotu	Total
1986 population	55,250	14,616	18,457	49,831	30,413	80,032	21,796	14,781	285,176
annual growth rate	3.0	3.2	2.9	4.3	6.8	2.7	3.6	2.8	3.5
% national population	19	5	6	17	11	28	8	5	100
peri-urban population	3,710	1,901	1,622		30,413	3,252	2,588	1,295	44,781
% peri-urban	7	13	9	38		4	12	9	16
males	29,202	7,329	9,850	26,251	17,293	39,605	11,174	7,268	147,972
females	26,048	7,287	8,607	23,580	13,120	40,427	10,622	7,513	137,204
sex-ratio	112	101	114	111	132	98	105	97	108
number of households	7,942	2,362	3,079	8,072	4,317	12,417	3,278	2,375	43,842
household size	6.96	6.19	5.99	6.17	7.04	6.45	6.65	6.22	6.50
Age composition (%)									
0 - 14	46.4	48.8	45.7	46.8	39.2	50.2	50.7	49.6	47.3
15 - 29	27.2	22	26	27.2	35.7	21.7	23.3	23.3	25.8
30 - 44	13.5	13.9	14.4	14	17.1	13.2	13.1	13.3	13.9
45 - 59	8	8.5	8.2	7.3	5.8	9.1	8.2	8.5	8.1
60 +	4.9	6.7	5.7	4.6	2.1	5.7	4.6	5.5	4.9

Source: Statistics Office Statistical Bulletin 3/88

3.2 In November 1986 the population of Solomon Islands was 285,176 with an annual growth rate of 3.5%. The national mean household size was 6.5, resulting in a total of 43,842 households, of which at least 84% are rural. Guadalcanal, Malaita and Western Provinces account for 77% of the national population.

3.3 The age composition of the Solomon Islands population is young with a wide based, tapering population pyramid. The "dependency ratio" (the number of persons under 15 years and over 60 years of age per 100 persons aged 15 to 59 years) is **109**[2].

3.4 The total fertility rate is **6.4** children per woman at the end of her child bearing age. The life expectancy at birth among males is **59.9** years, and among females is **61.4** years. Male infant mortality is **40** per thousand live births compared with a female infant mortality of **36** per thousand live births[2].

3.5 In the census **40,046** persons attended school during 1986, although some disruption was caused by Cyclone Namu. Among all persons aged 5 years and over not attending school in 1986, **51%** had no education. Primary school attendance spans a wide age range, but **20%** of age group 10 to 24 never attended school.

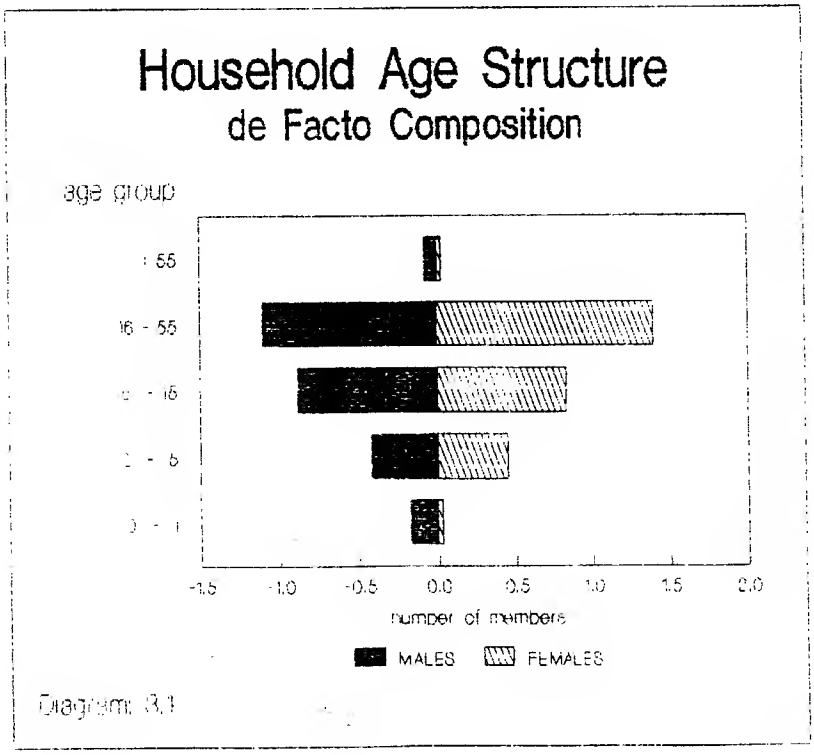
3.6 **94.2%** of the Solomon Islands population is Melanesian, 3.7% Polynesian and 2.1% other ethnic groups, but mainly Kiribati. 17% of the census population were residing in a province other than that of their birth, indicating a considerable level of internal migration. Onward movement is particularly strong from Malaita, resulting in net out-movement. This is true for provinces other than Central and Guadalcanal which experience a net in-movement. All provinces showed a net movement to Honiara.

3.7 Household composition results from the farming systems survey are summarised in table 3.2. Age categories are chosen to provide approximate conversion into "available labour units". The membership of a household often includes relatives and, less commonly, non-relatives (these are both referred to as "relatives" in the table). Both family and non-family members define the "de facto" household size which is the actual number of people residing in the household, and is illustrated in diagram 3.1. A second measure of household composition is the number of immediate family members (father, mother, sons and daughters) either living at home or living away. This is known as the "de jure" family size.

Table: 3.2
HOUSEHOLD COMPOSITION

Mean Number of Household Members:

MALE					AGE GROUP	FEMALE				
living at HOME				AWAY		living at HOME			AWAY	
Head	Family	Relative		Family		Head	Family	Relative	Family	
0.08					> 55		0.03			
0.87	0.18	0.05		0.30	16 - 55	0.05	1.20	0.15	0.03	
	0.85	0.03		0.10	6 - 15		0.78	0.05	0.03	
	0.42				2 - 5		0.40	0.05	0.03	
	0.15	0.03			0 - 1		0.03			total
Category total:	0.95	1.60	0.11	0.40		0.05	2.44	0.25	0.09	5.39
Family at home:		2.55					2.49			5.04
De Facto total:			2.66					2.74		5.40
De Jure total :				2.95					2.58	5.53



3.8 In the survey area the average family size is 5.53. With 9% of family members living away from home, a household has on average 5.40 members, of which 5.04 are immediate family and the remainder relatives or others residing in the household. Of the family members living away 0.33 are in the economically active age group 16 - 55 and 0.16 are younger than 15 . Of 2.95 male family members 2.55 live at home, representing a net onward movement of 14% among male family members. This is not compensated for by non-family male household members, since there are 2.66 males in the household.

3.9 Of 2.58 female family members 2.49 live at home, representing an onward movement of 13% . This is more than compensated for by additional non-family female members living in the household since there are 2.74 female members of the household.

3.10 There is then a 10% net outward movement of males and a 6% net inward-movement of females. This results in a household gender composition of 2.66 male household members to 2.74 females, a ratio of 1:1.03 males to females.

3.11 Household composition is converted into "adult equivalent labour units" in table 3.3 according to factors employed by Bathgate[18] (although there are slight differences in age classes between the two studies). An average household of 3.08 labour units is made up of 1.41 male units and 1.67 female units, a ratio of 1:1.18 male to female labour units.

Table: 3.3
HOUSEHOLD LABOUR AVAILABILITY

Mean number of members by age group:

MALES de Jure	MALES de Facto	MALES labour	AGE GROUP	FEMALES de Jure	FEMALES de Facto	FEMALES labour	TOTAL de Jure	TOTAL de Facto	TOTAL labour
0.08	0.08	0.05	> 55	0.03	0.03	0.02	0.11	0.11	0.07
1.35	1.10	1.10	16 - 55	1.28	1.40	1.40	2.63	2.50	2.50
0.95	0.88	0.26	6 - 15	0.81	0.83	0.25	1.76	1.71	0.51
0.42	0.42		2 - 5	0.43	0.45		0.35	0.37	
0.15	0.18		0 - 1	0.03	0.03		0.18	0.21	
Total	2.95	2.66	1.41	2.58	2.74	1.67	5.53	5.40	3.08

Labour availability assumes the following conversion factors:

age class	factor
> 55	0.6
16 - 55	1.0
6 - 15	0.3
0 - 5	0.0

Chapter: 4
INCOME EARNING ACTIVITIES

4.1 2.5% of rural households in the country were enumerated in the 1982 Household Income and Expenditure Survey [3] conducted by the Statistics Office of the Ministry of Finance. Virtually all rural households had food gardens. **39%** sold copra and **41%** sold garden produce, with an average monthly income from sales of SI$ 56. A summary of income earning activities according to the 1982 survey compared with the 1986 population census is presented in table 4.1.

Table: 4.1
1982 INCOME AND EXPENDITURE SURVEY: SALES

activity	% households earning income	
	1982	1986
copra	39	29
coconut	18	
cocoa	0.38	9
betel nut	1.25	17
other cash crop	12	
garden produce	41	34
cattle		2
pigs		12
poultry		10
fish	24	17
crabs, lobster		4
beche de mer		12
shells	7	
carvings	4	
hand crafts	0.38	4
canoes		3
mats, baskets		10
thatch		4
houses		5
other sales	1.13	

Source: Statistics Office Natioanl Accounts Discussion Document No 2
Statistics Office Bulletin 12/88

4.2 These figures show the importance of garden produce sales as an income earning activity, although the relative magnitude of earnings is not known. Copra is the major cash earning commodity, showing an apparent contraction in the proportion of rural sales. Cocoa sales have, in contrast, expanded.

4.3 In the 1982 survey **27%** of rural households had at least one member in paid employment, from which the average monthly wage was **SI$103**. **16%** had their own business and **39%** of households had a share in a cooperative (although it is stated that this result should be treated with caution). **10%** of households held a loan, with an average monthly repayment of **SI$87**, the majority with the Development Bank of Solomon Islands.

4.4 On average a household spent **SI$57** per month on goods and services of which **47%**, or **SI$27**, was on food. Less frequent expenditures amounted to **SI$5** per month.

4.5 Reported (cash and non-cash) income was **SI$147** compared to monthly expenditures of **SI$131**. The average cash component of income amounted to **SI$86** per month compared with expenditures of **SI$74**. The excess of **17%** in income over expenditure was believed to be due to the underestimation of production costs rather than the true value of rural savings.

4.6 The 1986 census [2] found that **25%** of the population aged 14 years and over was working for money (the week before the census enumeration), and about half of those also performed village work such as track clearing and church construction. About **80%** of those not engaged in cash employment performed village work.

4.7 **35%** of males were engaged in cash employment compared with **13%** of females. The 1982 Household Income and expenditure survey also states that "generally boys had a better chance of attending school than girls".

4.8 The rural economy is diverse, with a variety of farm and off-farm activities which contribute to household income. Results from the farming systems survey are presented in table 4.2. The table describes the proportion of households undertaking income earning activities in the survey area. Rural income and expenditure patterns are covered by other (non AES) surveys - planned or recently undertaken - and so the present survey does not investigate the relative importance of activities undertaken

in terms of income earned, except in Chapter 19 on marketing.

Table: 4.2

INCOME EARNING ACTIVITIES

	⟨---- % households ----⟩ by activity individual	group	summary of individual activities
Households Earning Income Over the Past Year From:			
COCONUTS			
Coconuts	15	23	+++++++
Copra	30	38	+++++++++++++++
Coconuts and Copra	8		+++
Total	53		
COCOA			
Wet beans			
Dry Beans			
Wet and Dry Beans			
Total			
OTHER CROPS			
Food Crops	58	73	++++++++++++++++++++++++++++
Other Cash Crops		13	
Food and Cash Crops	10		+++++
Livestock		8	
Food crops and Livestock	5		++
Cash Crops and Livestock	3		+
Food, Cash Crops and Livesock			
Total	75		
FISHING			
Fish	35	35	++++++++++++++++++
Shellfish		3	
Fish and shellfish			
Crabs, etc		3	
Fish and Crabs			
Shellfish and Crabs	3		+
Fish, Shellfish and Crabs			
Total	38		
LOGGING/MINING			
Logging			
Sawmill			
Logging and Sawmill			
Mining			
Logging and Mining			
Sawmill and Mining			
Logging, Sawmill and Mining ..			
Total			

INCOME EARNING ACTIVITIES (continued)

	⟨---- % households ----⟩ by activity		
	individual	group	summary of individual activities
PROFESSION			
Teacher	3	3	+
Government Employee			
Other Profession	10	10	+++++
Total	13		
COOPERATIVE			
Crop Production Cooperative ..			
Marketing Cooperative			
Crop and Marketing			
Cooperative Shop	28	28	++++++++++++
Crop and Shop			
Marketing and Shop			
Crop, Marketing and Shop			
Total	28		
BUSINESS			
Private shop	23	25	++++++++++
Vehicle Hire			
Shop and Vehicle			
Crafts	5	8	++
Shop and Crafts	3		+
Vehicle and Crafts			
Shop, Vehicle and Crafts			
Total	30		
SKILLED TRADE			
Joiner/housebuilder	3	3	+
Mechanical Trade			
Joiner and Mechanical			
Other Skilled Trade	3	3	+
Joiner and Other			
Mechanical and Other			
Joiner, Mechanical and Other .			
Total	5		

4.9 In the table are two columns, entitled "individual" and "group". Individual activities distinguish between combinations of activities - treating for instance "food crops" (only), "livestock" (only) and both "food crops and livestock" as three distinct activities. The percentages of households for individual activities are additive, and are shown as a "total" for each set of related activities in the table.

4.10 Under group activities - all occurrences of "food crops" and all occurrences of "livestock" are summarised under the two main headings, since "livestock" and "food crops and livestock" are both livestock activities. "Group" activities represent an alternative summary for the data set, and are non additive.

4.11 To the right of table 4.2 is a histogram summary of individual activities. Diagram 4.1 provides a visual summary of grouped activities.

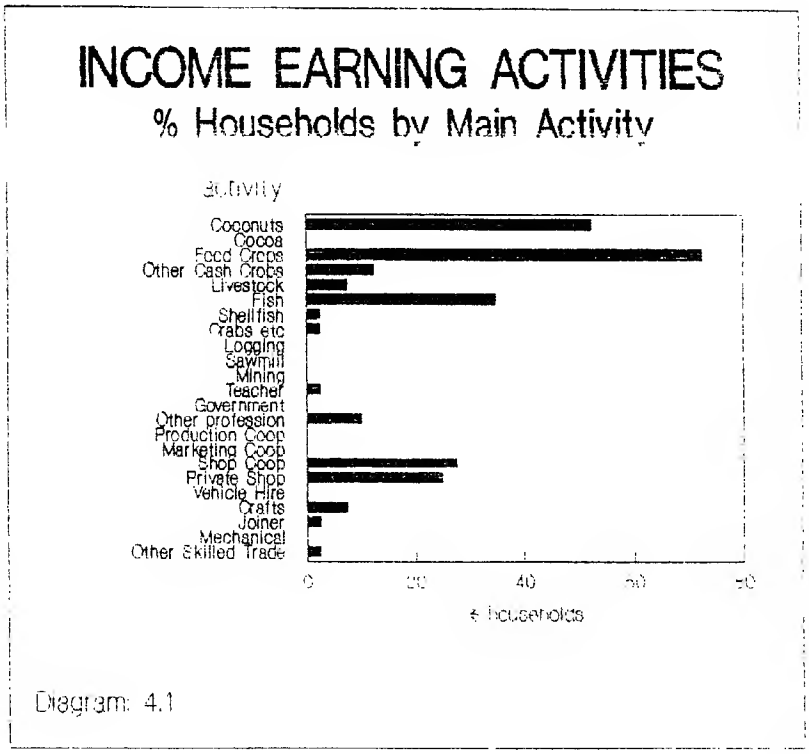


Diagram: 4.1

4.12 Agricultural income earning activities in the survey area are mainly the sale of food crops, fishing and the sale of coconuts and copra. 73% of sampled households earn income from food crop sales, 13% earn income from minor cash crops, and 8% from livestock sales. 38% of households earn income from fishing, mainly from the sale of fish and to a minor extent from shellfish and crabs.

4.13 38% of households earn income from copra and 23% of households earn income from fresh coconuts.

4.14 13% of households earn income from a profession. 30% of sampled households earn income from private shops and crafts and 28% of households earn income from cooperative shops. 5% of households have a skilled trade.

Chapter: 5
EXTENSION AND MASS MEDIA

5.1 Table 5.1 summarises the penetration of mass media and extension in the survey area.

Table: 5.1
EXTENSION AND MASS MEDIA

	% households	summary
i) Households Listening to Agricultural Programmes on the Radio:		
Never listen	53	++++++++++++
Listen weekly	25	++++++
" monthly	5	+
" occasionally	18	++++
Total	100	
ii) Households with Members who can Read and Write:		
Not able to read or write	20	+++++
Able to read		
" write		
" read and write	80	++++++++++++++++++
	100	
iii) Households Visited by (any type of) Extension Worker:		
Never been visited	93	++++++++++++++++++++++
Visited very occasionally		
" once per year	3	.
" " " 6 months	3	.
" " " 3 months		
" " " month		
" " " week		
Don't know	3	.
	100	
iv) Households in which Members have Attended Training:		
Never attended training	93	++++++++++++++++++++++
Attended village meeting	5	+
" day course at training centre		
" village meeting and day course		
" residential course	3	.
" village meeting and residential course		
" day and residential course		
" village meeting, day and residential course		
	100	
	100	

5.2 Travel and communication are difficult in Solomon Islands, with scattered islands of low population densities. Radio offers a means of transmitting information throughout the country, albeit one-way, and in a medium which makes few demands on literacy. In the survey **47%** of households listen to agricultural programmes on the radio, although mostly only occasionally. The communication of agricultural and other development information by radio may be extended further by word of mouth.

5.3 The second part of the table shows the proportion of households in which at least one member is able to read or write. According to these results **80%** of households have at least one member with some reading and writing skills. The survey was unable to verify the level of skills or to substantiate this finding objectively, but the result suggests that simple written materials are an appropriate extension medium. In more general terms, pictural materials would be popular together with simple text and annotation.

5.4 The frequency of extension visits is investigated in the third part of the table, and is illustrated in diagram 5.1.

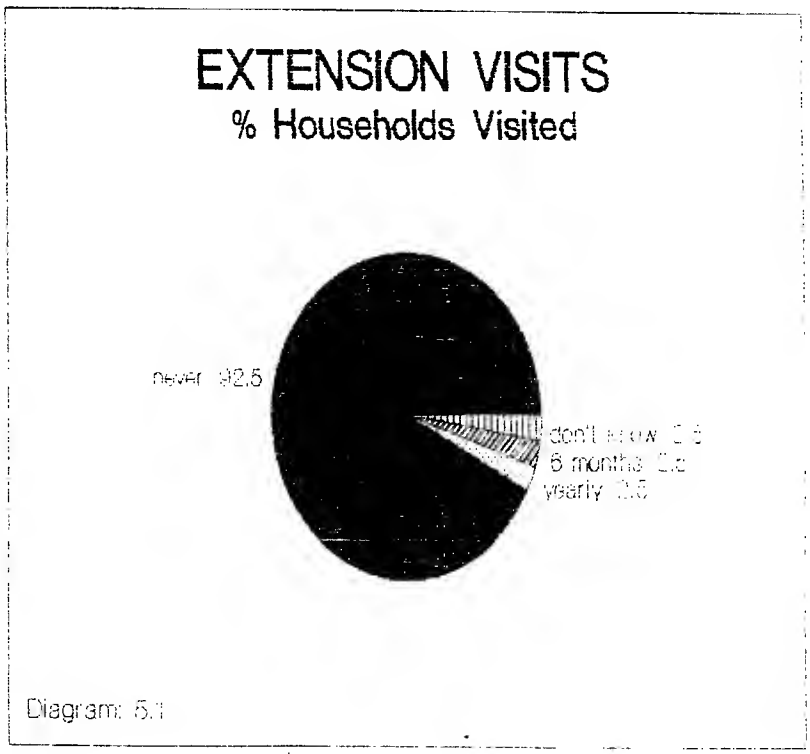


Diagram 5.1

5.5 Extension in the present study refers to any agricultural worker in government extension, research, NGOs or other organisations. Only a small proportion of households have received extension visits or agricultural training.

Chapter: 6
LIVESTOCK

6.1 Livestock, particularly small stock such as pigs and chickens, are an important feature of smallholder agriculture in Solomon Islands.

6.2 The number of cattle in the 1985 census was **19,750** - a fall of 13.1% from 1984 due largely to destocking in the plantation sector. Overall the national herd was 22% below its peak of 1978, with an average annual fall of 3.4%[4].

6.3 The smallholder sector accounted for 7,612 cattle, **39%** of the national herd, showing a decline of **4.1%** from the 1984 census. The distribution of cattle throughout the country is shown in table 6.1.

Table: 6.1
CATTLE DISTRIBUTION IN 1985

Province	total cattle	% distribution
Western	4,841	25
Ysabel	1,110	6
Central	2,081	10
Guadalcanal	6,292	32
Malaita	3,810	19
Makira	1,462	7
Temotu	217	1
Total	19,750	100

Source: Statistics Office, 1985 Cattle Census

6.4 In the 1982 Income and Expenditure Survey[3] it was found that **37%** of households owned pigs, **30%** owned chickens, but only **8%** owned cattle. The provincial breakdown is shown in table 6.2.

6.5 According to the 1986 Population Census[2] **2%** of households earned income from cattle, **12%** earned income from pigs and **10%** earned income from poultry.

Table: 6.2
LIVESTOCK DISTRIBUTION IN 1982

Province	% households owning		
	cattle	pigs	chickens
Western	2	19	24
Ysabel	42	25	47
Central		28	7
Guadalcanal	2	63	41
Malaita	9	35	28
Makira	10	69	63
Temotu		40	4
Total	8	37	30

Source: Statistics Office, 1982 HH Income and Expenditure Survey

6.6 8% of households earned income from livestock (table 4.2) sales.

6.7 Table 6.3 summarises livestock ownership in the survey area, and is divided into three columns. The first, entitled "ownership %", specifies the percentage of households which own livestock. The middle two columns show mean stock held: firstly among livestock owning households (owners); and secondly as an average of all farmers in the survey area (both owners and non-owners). To the right of the table is a histogram summary of ownership based on the mean among all farmers.

6.8 The table is divided horizontally into three main parts. The first part specifies stock numbers kept predominantly for home use, but which may include occasional sales. The second part specifies stock numbers where livestock comprise an income earning enterprise. The third part is the overall mean of livestock ownership irrespective of type of enterprise. (Note that overall mean ownership figures are derived from the original data and may not be obtained from summation of the table entries above).

6.9 At the foot of the table is a component on novel livestock enterprises, such as bees, butterflies and crocodile farming, however, these were not encountered in the survey.

Table: 6.3
LIVESTOCK

Livestock Ownership:

	ownership %	(-- mean ownership among owners	--) all farmers	summary all farmers
i) Home Use				
Cattle				
Pigs	50	1.80	0.90	+++
Goats				
Chickens	38	7.13	2.68	++++++++++
Ducks				
Horses				
ii) Commercial				
Cattle				
Pigs	3	2.00	0.05	.
Goats				
Chickens				
Ducks				
Horses				
iii) Total				
Cattle				
Pigs	50	1.90	0.95	+++
Goats				
Chickens	38	7.13	2.68	++++++++++
Ducks				
Horses				

iv) Households Earning Income	(---- % households by activity individual	group ----)
Income from:		
1. Bees or honey		
2. Butterflies		
3. Bees and Butterflies		
4. Crocodiles		
5. Bees and crocodiles		
6. Butterflies and crocodiles		
7. Bees, butterflies and crocodiles ..		

6.10 There is generally a low level of commercialism in the management of livestock in the Lata area. Although there are cattle projects these are mainly among wealthy farmers. Cattle are kept for sale, but the high cost of establishing paddocks, poor marketing facilities and lack of experience with large stock has restricted the development of cattle and none are included among sampled farmers.

6.11 Pigs play an important role in the custom and life of rural households. They are kept mainly for ceremonial feasts, weddings and funerals, and other social gatherings. 50% of sampled farmers keep pigs with a mean herd size of 1.90 among owners.

6.12 Pigs are generally penned or tethered by the hind leg. Management is minimal, although they will be fed in the morning and evening and watererd where necessary.

6.13 Chickens are kept for sale and for family consumption. They are either housed using bush materials or are allowed to free range, requiring minimal management. Chickens are kept by 38% of sampled households with a mean flock size of 7.13 among owners.

Chapter: 7
HOLDING SIZE DISTRIBUTION

7.1 Holding size distribution is of interest because it provides an understanding of the structure of agriculture and may help to explain constraints faced by farmers or response to services.

7.2 Table 7.1.i describes the holding size distribution of the survey area. Two households are excluded since they had no cropped land. Holdings are in general small and a high proportion of farmers have very small areas. With a mean holding size of **0.710ha**, **61%** of farmers have holdings smaller than 0.5ha. This can be seen in diagram 7.1 which shows that inequality in the holding size distribution arises largely because a high proportion of farmers fall in the very low holding size class of 0 to 0.25ha.

7.3 The mean describes the "average" holding size and is of interest in that it provides a value for the "middle" of the data based on the spread of values, but it may be misleading when unbalanced extreme values occur. Another measure of central tendency is the median which is the "mid-point" in the data, the value of the middle item when the data are arranged in order. In a "normal distribution" the median and the mean coincide. The median in this case is **0.361ha** which is appreciably lower than the mean holding size.

7.4 An indicator of variability is the range, which is derived from extremes in the data. The minimum area is **0.012ha** and the maximum is **2.942ha**, a fairly small range of **2.930ha**.

7.5 The standard deviation is a measure of variation based on the extent to which values deviate from the mean. If the data are closely bunched the standard deviation is small, and if they are widely spread it is large. In a normal distribution 68% of values lie within 1 standard deviation on either side of the mean, and 95% within 2 standard deviations. In the survey results the mean of **0.710ha** has a standard deviation of **0.801** and a coefficient of variation of **113%** (the standard deviation expressed as a percentage of the mean).

7.6 Skewness is an index of symmetry in the data. A normal distribution is symmetrical about the mean, with a skewness coefficient of zero, whereas a skewed distribution has a longer "tail" on one side than the other. The present data have a skewness of 1.373 indicating only slightly positive skewness.

7.7 Kurtosis is the extent to which the data cluster around a central point. When this occurs the distribution appears "peaked". Positive values of kurtosis indicate that the distribution is more peaked than normal. In the present data set has a low coefficient of kurtosis of 1.055.

7.8 The indications are that there is inequality in holding size distribution, since a high proportion of farmers have very small holdings while a few have relatively large holdings. The holding size distribution may be viewed in standard form in diagram 7.2. The diagonal represents the holding size distribution for equality and the curve below represents the actual (cumulative) holding size distribution. The area between the diagonal and the curve is the "area of inequality". The larger the area of inequality, the more unequal the holding size distribution. This may be expressed as an index, called the "Gini coefficient", which is the area between the two lines expressed as a proportion of the area of the triangle below the diagonal. The Gini coefficient ranges from 0 (for perfect equality) to 1 (for perfect inequality). The Gini coefficient here is 0.560, indicating a moderately high degree of inequality.

Table: 7.1
HOLDING SIZE DISTRIBUTION

i) All holdings and all crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .25	17	0.1060	1.80	45	7	45	7
.25 - .5	6	0.4037	2.42	16	9	61	16
.5 - .75	1	0.7037	0.70	3	3	63	18
.75 - 1	3	0.9048	2.71	8	10	71	28
1 - 1.25	4	1.0566	4.23	11	16	82	44
1.25 - 1.5						82	44
1.5 - 1.75	3	1.6715	5.01	8	19	89	63
1.75 - 2						89	63
2 - 2.5	2	2.2338	4.47	5	17	95	79
2.5 - 3	2	2.8126	5.63	5	21	100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
Total	38	0.7099	26.98	100	100		

Mean	0.710	S.E. Mean	0.130
Median	0.361	Coef. of Var %	113
Std Dev	0.801	Variance	0.642
Kurtosis	1.055	S.E. Kurtosis	0.750
Skewness	1.373	S.E. Skewness	0.383
Range	2.930	Minimum	0.012
Maximum	2.942	Sum	26.976
Gini	0.560		

Note that the main table is a frequency distribution of grouped intervals, while the statistics at the foot of the table describe the ungrouped data set.

HOLDING SIZE DISTRIBUTION

all holdings - all crops

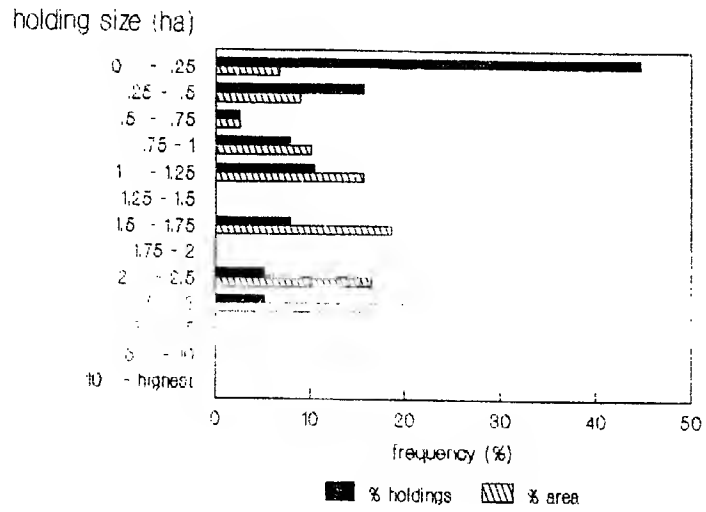


Diagram: 7.1

LORENZ CURVE

all holdings - all crops

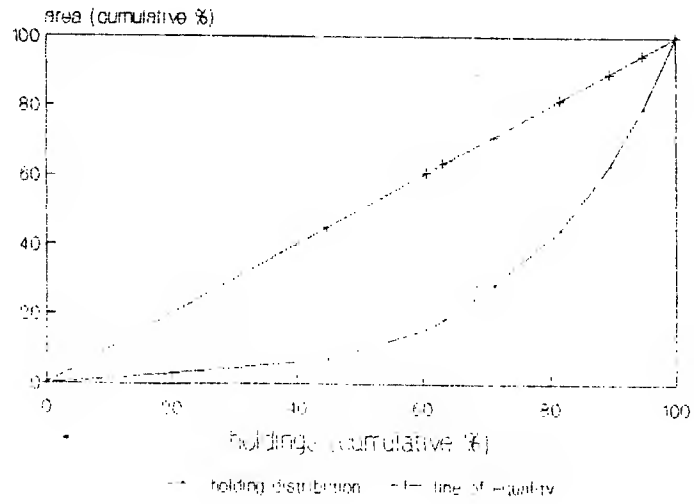


Diagram: 7.2

7.9 Table 8.1.ii shows the holding size distribution of only those farmers who have tree crops. The sample is reduced from 38 to 20, and so the stratum of farmers with tree crops represents **53%** of farmers in the sample.

7.10 The mean holding size among tree cropping farmers is **1.226ha** and the median is **1.035ha**. The coefficient of skewness has dropped to **0.756** and kurtosis is slightly negative. The range remains wide, but the majority of very small holdings are excluded so that the distribution is less scattered, with a coefficient of variation of **66%**.

ii) Holdings with tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .25	1	0.1706	0.17	5	1	5	1
.25 - .5	4	0.3975	1.59	20	6	25	7
.5 - .75	1	0.7037	0.70	5	3	30	10
.75 - 1	3	0.9048	2.71	15	11	45	21
1 - 1.25	4	1.0566	4.23	20	17	65	38
1.25 - 1.5						65	38
1.5 - 1.75	3	1.6715	5.01	15	20	80	59
1.75 - 2						80	59
2 - 2.5	2	2.2338	4.47	10	18	90	77
2.5 - 3	2	2.8126	5.63	10	23	100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
Total	20	1.2256	24.51	100	100		

Mean	1.226	S.E. Mean	0.180
Median	1.035	Coef. of Var %	66
Std Dev	0.804	Variance	0.647
Kurtosis	-0.311	S.E. Kurtosis	0.992
Skewness	0.756	S.E. Skewness	0.512
Range	2.771	Minimum	0.171
Maximum	2.942	Sum	24.512
Gini	0.351		

7.11 The new distribution of farmers with tree crops is illustrated in diagram 7.3, and its associated Lorenz curve in diagram 7.4. Inequalities have been slightly reduced by excluding the smaller holdings and the holding size distribution is more "normal" with a Gini coefficient of **0.351**.

HOLDING SIZE DISTRIBUTION

holdings with tree crops

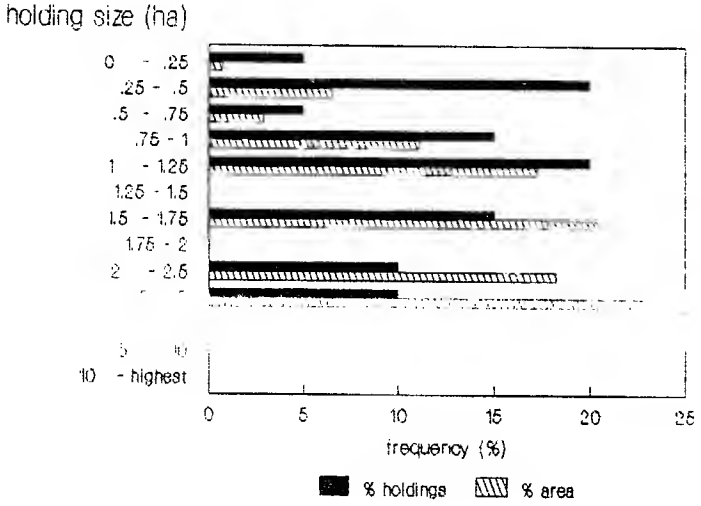


Diagram: 7.3

LORENZ CURVE

holdings with tree crops

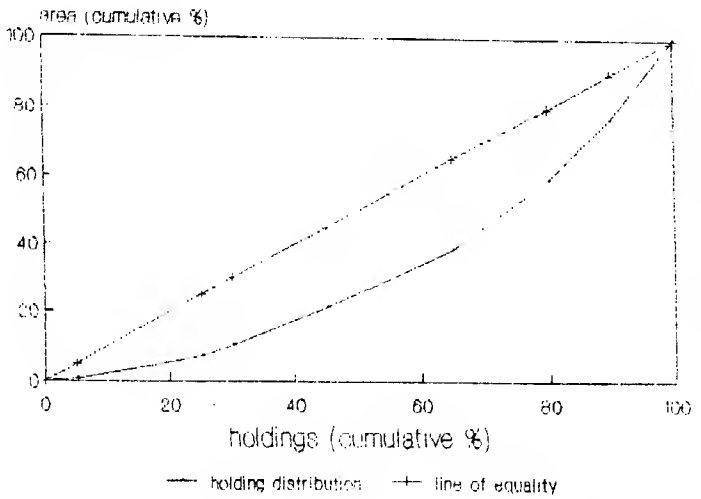


Diagram: 7.4

7.12 The corresponding stratum of farmers with no tree crops is shown in table 7.1.iii. 18 farmers, or **47%** of the sample have no tree crops. The mean holding size is **0.137ha** and the median is **0.116**. The range is small although a high proportion of farmers again tend to have very small holdings so that skewness is **1.857** and kurtosis is **3.776**. The distribution has a coefficient of variation of **85%**.

7.13 The holding size distribution is illustrated in diagram 7.5, and its associated Lorenz curve in diagram 7.6. Inequality is low with a Gini coefficient of **0.361**.

iii) Holdings without tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .1	7	0.0497	0.35	39	14	39	14
.1 - .2	9	0.1426	1.28	50	52	89	66
.2 - .3						89	66
.3 - .4	1	0.3562	0.36	6	14	94	81
.4 - .5	1	0.4761	0.48	6	19	100	100
.5 - .6						100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	18	0.1369	2.46	100	100		

Mean	0.137	S.E. Mean	0.027
Median	0.116	Coef. of Var %	85
Std Dev	0.116	Variance	0.014
Kurtosis	3.776	S.E. Kurtosis	1.038
Skewness	1.857	S.E. Skewness	0.536
Range	0.464	Minimum	0.012
Maximum	0.476	Sum	2.464
Gini	0.361		

Note the smaller size classes in this table with respect to previous tables.

HOLDING SIZE DISTRIBUTION

holdings without tree crops

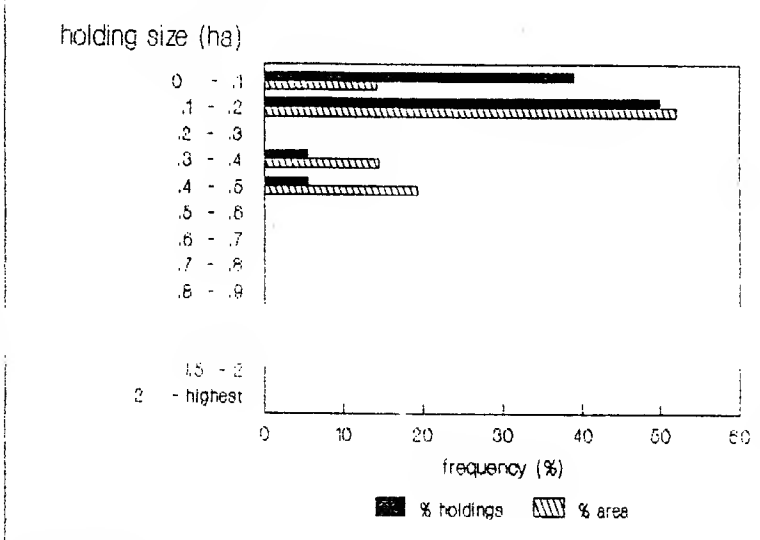


Diagram: 7.5

LORENZ CURVE

holdings without tree crops

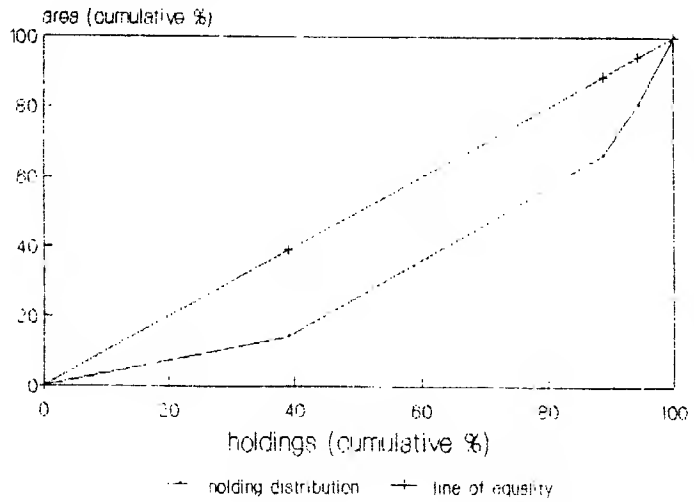


Diagram: 7.6

7.14 Table 7.1.iv describes the holding size distribution of all farmers, but excluding tree crop areas. One further household which has no food crops is excluded. The holding size distribution is illustrated in diagrams 7.7 and 7.8. These results are similar to those for non-tree crop farmers, indicating that subsistence cropping is similar among all farmers with a mean area of **0.142ha**.

iv) All holdings - total area excluding tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	⟨------- % --------⟩ holdings	area	⟨-- cumulative % --⟩ holdings	area
0 - .1	14	0.0516	0.72	38	14	38	14
.1 - .2	16	0.1523	2.44	43	46	81	60
.2 - .3	5	0.2504	1.25	14	24	95	84
.3 - .4	1	0.3562	0.36	3	7	97	91
.4 - .5	1	0.4761	0.48	3	9	100	100
.5 - .6						100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	37	0.1417	5.24	100	100		

Mean	0.142	S.E. Mean	0.017
Median	0.127	Coef. of Var %	71
Std Dev	0.100	Variance	0.010
Kurtosis	2.222	S.E. Kurtosis	0.759
Skewness	1.270	S.E. Skewness	0.388
Range	0.464	Minimum	0.012
Maximum	0.476	Sum	5.244
Gini	0.334		

HOLDING SIZE DISTRIBUTION

all holdings excluding tree crops

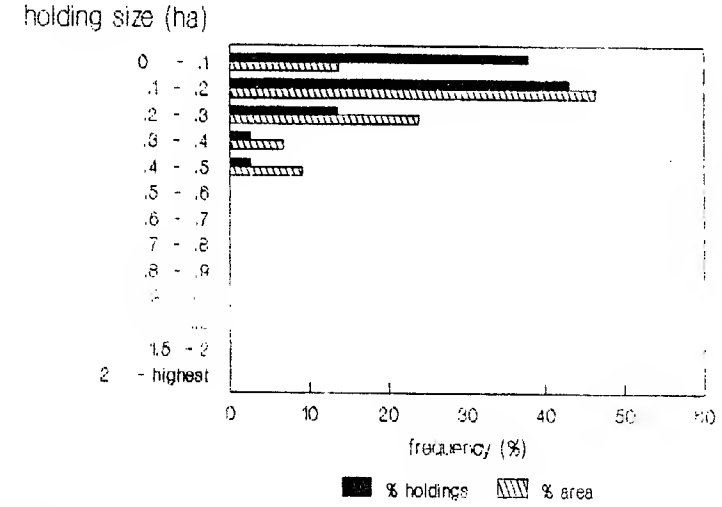


Diagram: 7.7

LORENZ CURVE

all holdings excluding tree crops

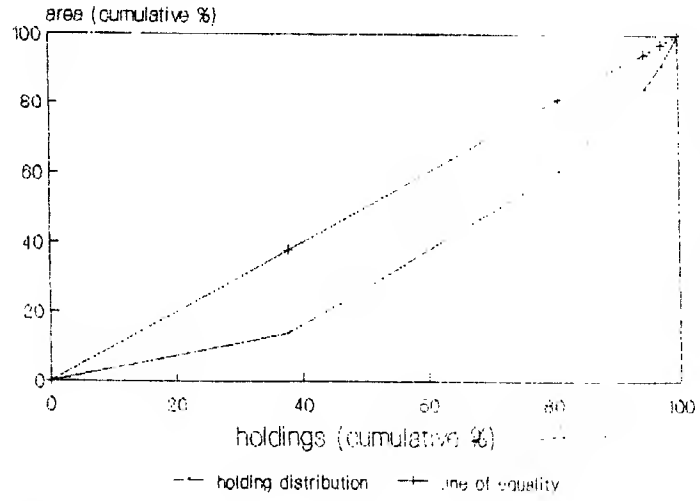


Diagram: 7.8

7.15 Table 7.1.v describes the size distribution of tree crop areas, illustrated in diagrams 7.9 and 7.10.

v) All holdings - total area of tree crops only

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	% holdings	% area	cumulative % holdings	cumulative % area
0 - .25	3	0.1256	0.38	15	2	15	2
.25 - .5	2	0.3505	0.70	10	3	25	5
.5 - .75	2	0.6664	1.33	10	6	35	11
.75 - 1	5	0.9239	4.62	25	21	60	32
1 - 1.25	1	1.0442	1.04	5	5	65	37
1.25 - 1.5	3	1.4867	4.46	15	21	80	58
1.5 - 1.75						80	58
1.75 - 2	2	2.0000	4.00	10	18	90	76
2 - 2.5	1	2.5000	2.50	5	12	95	88
2.5 - 3	1	2.7000	2.70	5	12	100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
Total	20	1.0867	21.73	100	100		

Mean	1.087	S.E. Mean	0.171
Median	0.993	Coef. of Var %	70
Std Dev	0.766	Variance	0.587
Kurtosis	-0.292	S.E. Kurtosis	0.992
Skewness	0.658	S.E. Skewness	0.512
Range	2.586	Minimum	0.114
Maximum	2.700	Sum	21.734
Gini	0.380		

7.16 Indicators of variability are low indicating that variability in holding size is largely accounted for by a high proportion of very small holdings without tree crops.

HOLDING SIZE DISTRIBUTION

all holdings - tree crops only

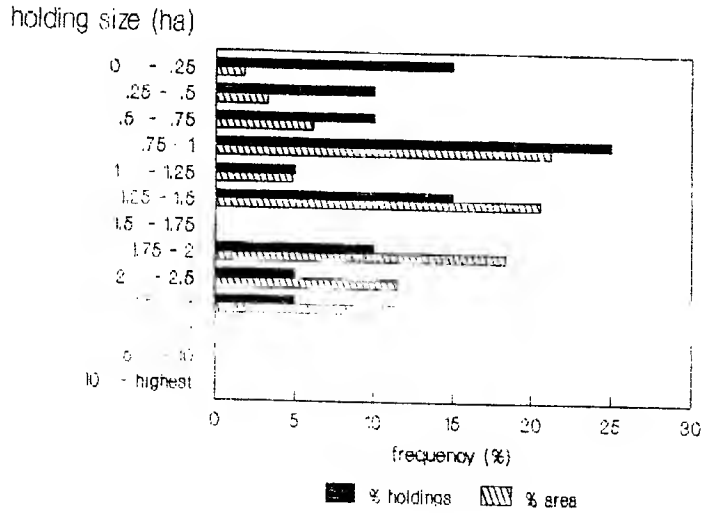


Diagram 7.9

LORENZ CURVE

all holdings - tree crops only

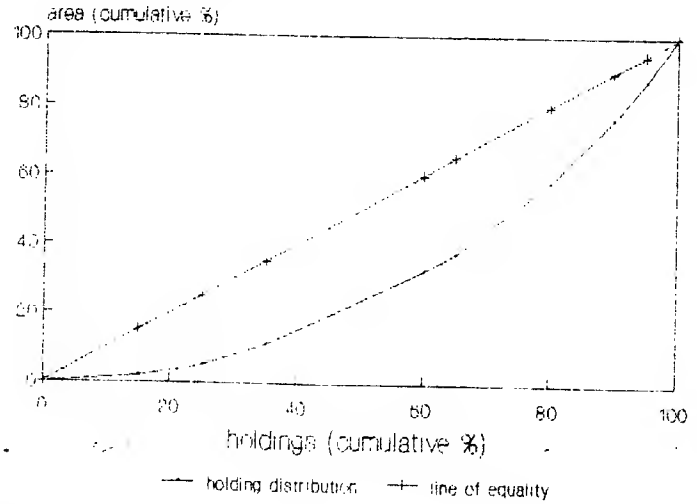


Diagram 7.10

Chapter: 8
LABOUR DENSITY

8.1 According to Bathgate[18] "increments in the population of a household do not result in an expansion in the garden area. Instead, the garden area holds constant and ... the actual area per consumption and labour unit decreases ... Although there is a variation ... the average household ... tends to clear a fairly similar amount of land for gardens and plant a similar area of root crops". Bathgate postulates that there is no relationship between household size and food garden area. Larger family sizes are not then associated with larger holdings, and he attributes this to a tendency among subsistence producers to cultivate in excess of household requirements as insurance against crop failure.

8.2 In the present survey the area of food crops is found to be relatively constant in comparison to a variabile tree crop area. Table 8.1 shows the relationship between holding size and labour availability.

Table: 8.1
LABOUR DENSITY - ALL HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	3.13	0.71	4.41	38
< .25	2.83	0.11	26.69	17
.25 - .5	3.32	0.40	8.22	6
.5 - .75	2.60	0.70	3.69	1
.75 - 1	2.37	0.90	2.62	3
1 - 1.25	3.43	1.06	3.24	4
1.25 - 1.5				
1.5 - 1.75	5.10	1.67	3.05	3
1.75 - 2				
2 - 2.5	2.50	2.23	1.12	2
2.5 - 3	3.65	2.81	1.30	2
3 - 5				
5 - 10				
> 10				

8.3 There is no apparent relationship between holding size and available labour. Results are in agreement with Bathgate's findings since labour density falls rapidly from **26.69** adult units per hectare for the smallest holding class (less than 0.25ha) to **1.30** units in the largest (2.5-3ha) class. Small holdings then have a very high labour density while the larger holdings have a low labour density, as seen in diagram 8.1.

8.4 Labour densities are high on small holdings and with a mean of **4.41** labour units per hectare, labour is unlikely to be seriously limiting.

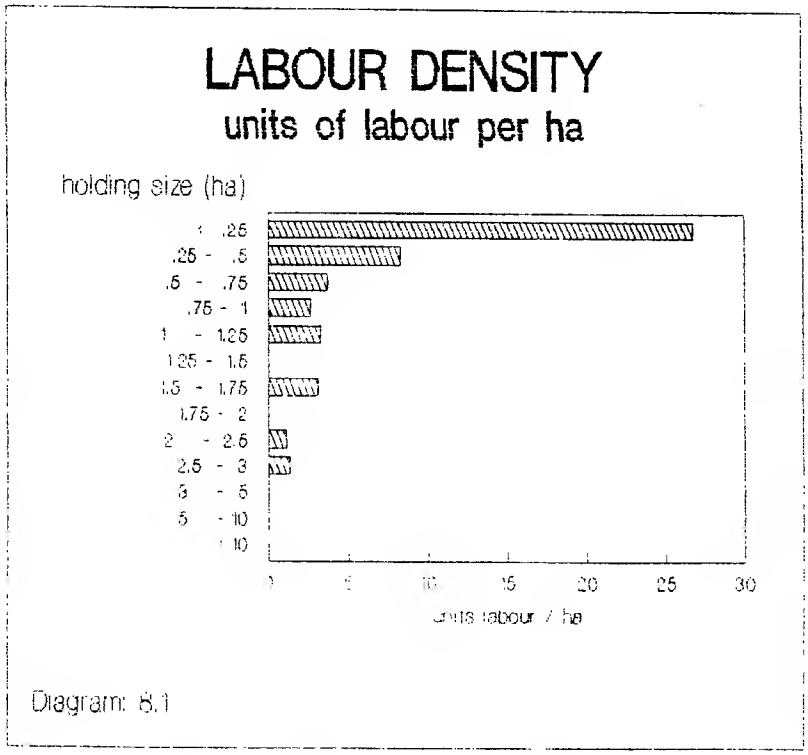


Diagram: 8.1

8.5 Holdings without tree crops are shown in table 8.2.

Table: 8.2
LABOUR DENSITY - NON-TREE CROP HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	2.82	0.14	20.57	18
< .25	2.88	0.10	28.25	16
.25 - .5	2.30	0.42	5.53	2
.5 - .75				
.75 - 1				
1 - 1.25				
1.25 - 1.5				
1.5 - 1.75				
1.75 - 2				
2 - 2.5				
2.5 - 3				
3 - 5				
5 - 10				
> 10				

8.6 The range of holding size is much smaller and the mean labour density is 20.51 labour units per hectare. The largest holdings of up to 0.5ha in size have a labour availability of 5.53 units per hectare. All holdings then have a high labour density.

8.7 Holdings with tree crops are shown in table 8.3.

Table: 8.3
LABOUR DENSITY - TREE CROP HOLDINGS

holding size class (ha)	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	3.42	1.23	2.79	20
< .25	2.00	0.17	11.72	1
.25 - .5	3.83	0.40	9.62	4
.5 - .75	2.60	0.70	3.69	1
.75 - 1	2.37	0.90	2.62	3
1 - 1.25	3.43	1.06	3.24	4
1.25 - 1.5				
1.5 - 1.75	5.10	1.67	3.05	3
1.75 - 2				
2 - 2.5	2.50	2.23	1.12	2
2.5 - 3	3.65	2.81	1.30	2
3 - 5				
5 - 10				
> 10				

8.8 There is again little or no apparent relationship between holding size and labour availability. The mean labour density is 2.79 units per hectare, falling off from 11.72 units per hectare on the smaller holdings to 1.30 units per hectare on the holding of 2.5 to 3ha in size.

8.9 Holdings are small and the availability of land is more likely to be a constraint to agricultural development than labour availability.

Chapter: 9
CROPPING PATTERNS

9.1 A "holding" is taken here to be the total area cultivated by a household. It includes all crops growing and land cleared, but does not include fallow which the family may have rights to cultivate.

9.2 A holding is divided into one or more "gardens", which are contiguous blocks of land growing similar crops. Only broad distinctions are made among crop types in gardens.

9.3 A garden may be subdivided into "plots" which are blocks within each garden growing a different crop mix, under different management, or planted at different times. Within plots detailed crop mixtures are recorded.

9.4 Table 9.1 describes cropping patterns at the garden level, maintaining the distinction between farmers with tree crop gardens and those without. A tree crop garden is taken to be a garden in which one or more plots have coconut or cocoa as the dominant crop.

9.5 Tree crop farmers have a mean holding size of **1.23ha**, of which **1.09ha** is tree crops and **0.14ha** food crops. In contrast, non-tree crop farmers have a mean holding size of **0.14ha**.

9.6 Tree cropping farmers tend to have more complex holdings, with an average of **2.50** gardens and **4.35** plots compared with **1.56** gardens and **2.61** plots among non-tree crop farmers.

9.7 Table 9.2 describes cropping patterns in more detail. This is derived from the aggregation of plot information in which complex mixtures are summarised by the dominant crop.

9.8 **10** major crop mixture classes are listed in table 9.2, predominantly coconuts and cocoa and root crops.

Table: 9.1
CROP COMPOSITION

i) All holdings

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	0.57	0.55	0.76	1.38	+++++
short term cash crops					
food crops	0.14	1.50	2.76	1.84	+
total	0.71	2.05	3.52	1.72	

number of observations = 38

ii) Holdings with tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	1.09	1.05	1.45	1.38	++++++++++
short term cash crops					
food crops	0.14	1.45	2.90	2.00	+
total	1.23	2.50	4.35	1.74	

number of observations = 20

iii) Holdings without tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops					
short term cash crops					
food crops	0.14	1.56	2.61	1.67	+
total	0.14	1.56	2.61	1.67	

number of observations = 18

Table: 9.2
CROPPING PATTERNS

	main crop in mixture	all farmers		farmers with no tree crops		farmers with tree crops	
		area (ha)	%	area (ha)	%	area (ha)	%
a	Cleared Land						
b	Coconut	0.569	80			1.082	88
c	Cocoa						
z	Coconut and Cocoa						
d	Pasture						
e	Grain Crops						
f	Beans						
g	Cabbage	0.002	0			0.004	0
h	Vegetables	0.000	0	0.000	0	0.000	0
i	Spices						
j	Fruit Crops						
k	Fruit trees						
l	Banana	0.008	1			0.015	1
m	Citrus trees						
n	Nut trees	0.004	1			0.007	1
o	Sugar cane						
p	Food/building tree						
q	Tobacco	0.000	0	0.000	0		
r	Sweet Potato	0.050	7	0.041	30	0.058	5
s	Taro	0.021	3	0.035	26	0.009	1
t	Yam	0.017	2	0.017	13	0.016	1
u	Pana	0.039	5	0.043	31	0.036	3
v	Cassava						
w	Other root crop						
	Total mean area (ha)	0.710		0.137		1.225	
	Number of households	38		18		20	

9.9 The spatial dominance of coconuts is seen clearly in diagrams 9.1 to 9.3 where coconuts account for 80% of the cropped area

9.10 Table 9.2 is still a simplification of cropping patterns found in the field. Table 9.3 describes in more detail the crop mixtures grown by farmers. This no longer applies to a "model" holding but, in aggregate, detailed cropping patterns may be used to determine proportional areas under crop mixtures. Mixtures are listed hierarchically to the left of the table according to the relative dominance of each crop in the mixture. The three main crops are listed by name and any further crops are referred to by code letters. The column of "mean plot area" records the mean area of plots measured in the field according to the number of observations shown in the next column to the right. The column on the far right is the proportional area by crop mixture.

9.11 Crop mixtures illustrate the complexity of smallholder farming systems, in which 50 distinct mixtures are recorded. Small areas of vegetable and short term cash crops, together with a variety of tree crops, are typically scattered among food gardens.

9.12 Table 9.4 summarises tree cropping. The table is in two parts, first showing the average number of trees and second the number of observations on which they are based. Each table is subdivided horizontally into cultivated garden and fallow, and vertically by garden type.

9.13 The averages in the top table are based on all plots (not only the plots in which trees are grown). In the far right column of the lower table is listed the number of observations for which trees are too numerous to count. These are excluded from the averages in the upper table.

CROPPING PATTERNS

all farmers

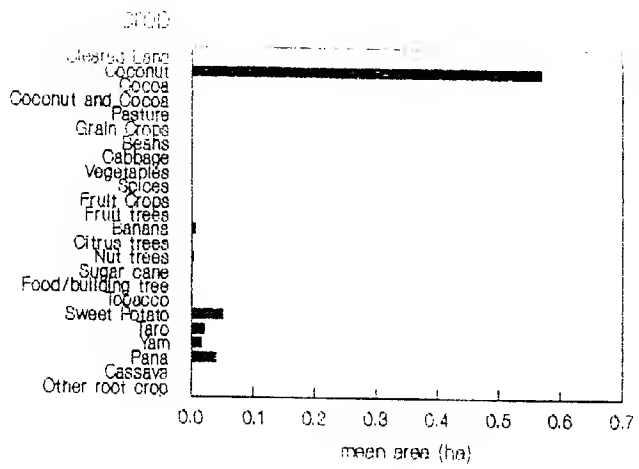


Diagram: 9.1

CROPPING PATTERNS

farmers with no tree crops

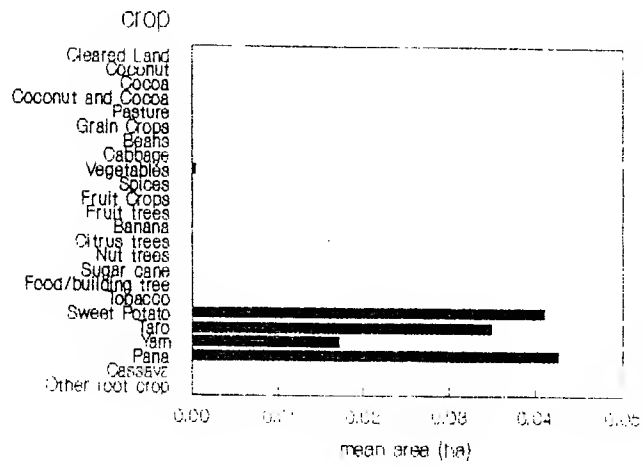


Diagram: 9.2

CROPPING PATTERNS

farmers with tree crops

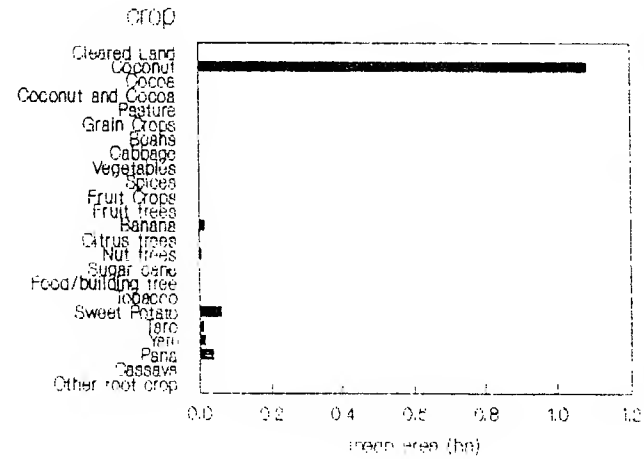


Diagram: 9.3

Table: 9.3
DETAILED CROPPING PATTERNS

crop code	main crop in mixture — crop name: first	second	third	minor mixture code	mean plot area (ha)	number of plots	% plots	% area
TOTAL					0.0267	134	100	100
b	Coconut				0.9014	24	18	80.19
g	Cabbage	Nut trees	Banana		0.0740	1	1	0.274
h	Vegetable				0.0013	7	5	0.032
l	Banana	Other root	Taro		0.2860	1	1	1.060
n	Nut trees	Food/building tree			0.1365	1	1	0.505
q	Tobacco				0.0021	1	1	0.007
r	Sweet potato				0.0290	16	12	1.720
		Grain crops			0.0431	1	1	0.159
			Cassava		0.0117	1	1	0.043
		Cabbage			0.0616	2	1	0.456
			Grain crops		0.0327	2	1	0.242
			Fruit crops		0.0958	2	1	0.710
			Banana		0.0361	1	1	0.133
			Sugar cane		0.0406	2	1	0.300
		Fruit crops	Grain crops	g	0.0365	1	1	0.135
			Beans		0.0066	1	1	0.024
			Banana		0.0292	2	1	0.216
			Sugar cane		0.0871	1	1	0.322
		Banana			0.0479	2	1	0.354
			Cabbage		0.0562	1	1	0.208
				o	0.0396	1	1	0.146
			Nut trees	g	0.0991	1	1	0.367
			Taro	g	0.0411	1	1	0.152
		Sugar cane			0.0273	2	1	0.202
			Cabbage		0.0217	1	1	0.080
			Banana	j	0.0885	1	1	0.328
			Taro		0.0265	1	1	0.098
		Taro	Banana		0.0391	2	1	0.289
		Cassava	Banana	kg	0.1011	1	1	0.374

CROPPING PATTERNS (continued)

crop code	main crop in mixture — crop name: first	second	third	minor mixture code	mean plot area (ha)	number of plots	% plots	% area
s	Taro				0.0692	7	5	1.796
		Grain crops			0.0070	1	1	0.025
		Cabbage	Sugar cane		0.0369	1	1	0.136
		Banana			0.0661	4	3	0.980
		Sugar cane			0.0195	1	1	0.072
t	Yam	Pana			0.0733	3	2	0.814
			Grain crops		0.1116	1	1	0.413
			Cabbage		0.0119	1	1	0.044
			Fruit crops		0.0352	1	1	0.130
			Banana		0.1180	1	1	0.437
			Sweet potato		0.0254	1	1	0.094
			Taro		0.0569	2	1	0.421
u	Pana				0.0110	1	1	0.040
		Banana			0.0227	3	2	0.252
		Taro	Fruit crops		0.0589	1	1	0.218
		Yam			0.0514	14	10	2.665
			Cabbage		0.0627	3	2	0.697
			Banana		0.0628	4	3	0.930
				o	0.0629	1	1	0.233
				so	0.0863	1	1	0.319
			Taro		0.0346	1	1	0.128

Crop Key:

a Cleared land	j Fruit crops	r Sweet potato
b Coconut	k Fruit trees	s Taro
c Cocoa	l Banana	t Yam
d Pasture	m Citrus trees	u Pana
e Grain crops	n Nut trees	v Cassava
f Beans	o Sugar cane	w Other root crop
g Cabbage	p Food/building tree	
h Vegetable	q Tobacco	
i Spices		

Table: 9.4
TREE CROPS IN GARDENS

(---------- average number of trees per garden ----------)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) In cultivated gardens:					
fruit trees		4.10		0.46	1.45
citrus				0.02	0.01
nut trees		3.24		0.25	1.06
sweet banana		1.00		0.67	3.76
cooking banana		1.20		8.00	6.11
ii) In fallow of gardens:					
fruit trees		1.19			0.32
citrus					
nut trees		3.00		0.04	0.83
sweet banana				0.45	0.32
cooking banana		1.14		0.57	0.73

(---------- number of observations ----------)

crop type:	cleared land	tree crops	short term cash crops	food crops	many but "unknown"
i) In cultivated gardens:					
fruit trees		21		56	1
citrus		21		57	
nut trees		21		56	1
sweet banana		20		55	3
cooking banana		20		52	6
ii) In fallow of gardens:					
fruit trees		21		57	
citrus		21		57	
nut trees		21		57	
sweet banana		21		56	1
cooking banana		21		56	1

9.14 Bananas, particularly for cooking, fruit trees and nut trees are crops of importance.

Chapter: 10
COCONUT AND COCOA

10.1 Coconut and cocoa have been studied in some detail before, both in the 1974-75 Sample Survey of Agriculture[5] and in the 1985 Coconut Survey[6]. Only comparative data are therefore included in the present survey.

10.2 Copra exports from Solomon Islands started in the late 19th century, rising from **1,220 MT** in 1895 to **23,000 MT** in the '20s and '30s. Following disruption during the second world war production did not achieve pre-war levels again until the 1960s. Copra production has continued to rise since, exceeding **40,000 MT** in 1984 and 1985. Following cyclone Namu copra production fell by about 20 to 25%, but showed some recovery in 1987/88.

10.3 The structure of the copra economy has varied considerably since the start of trading. Initially a smallholder crop, the plantation sector came to dominate production from 1915 onwards. Since the 1970s smallholder production has been growing by about **4.5%** annually and smallholder copra production now accounts for around **70%** of the total[8].

10.4 The area under smallholder coconuts has expanded considerably over the past 15 years, in part due to a subsidy scheme operating from 1968 to 1978 which was designed to encourage the rehabilitation, planting and replanting of coconut palms. Consequently the age structure of smallholder palms is young, with almost half the palms planted since 1970 and nearly **90%** planted since the war[8].

10.5 The total number of coconut palms in Solomon Islands is estimated to be around 9 **million**, covering an area of approximately **60,000 hectares**. Table 10.1 shows the provincial breakdown of copra production, in which Western, Guadalcanal, Malaita and Central Provinces account for about **80%** of production.

10.6 The mean national copra yield is 0.72 MT per hectare according to the 1985 Coconut Survey[7]. The 1974-75 Sample Survey of Agriculture found that the average number of coconuts per palm was 36 (30 in the 1985 Coconut Survey) and assumes an average whole nut weight of 1.2kgs with 190gm dried copra equivalent per nut. Disciplined plantings were found to yield 40% more per tree than customary plantings, but only 7% more per unit area because of the greater density of customary planted trees. This result was was questioned in the 1985 Survey.

Table: 10.1
COPRA AREA AND PRODUCTION BY PROVINCE (1984)

Province	(-- area --)		(-- production --)		yield	number of palms
	(ha)	%	(MT)	%	(MT/ha)	
Western	14,454	25	13,816	32	0.96	2,093,795
Ysabel	5,230	9	2,969	7	0.57	817,555
Central	7,909	13	9,073	21	1.15	1,287,680
Guadalcanal	12,758	22	7,324	17	0.57	1,824,790
Malaita	11,390	20	5,575	13	0.47	1,980,595
Makira	3,555	6	2,662	6	0.75	540,810
Temotu	3,032	5	1,167	3	0.38	494,420
Total	58,918	100	42,586	100	0.72	9,039,645

Source: Statistics Office, Solomon Islands (1986), Statistical Bulletin 18/86

10.7 The yield from well maintained plantations was found to be higher than from poorly maintained plantations, but the 1985 Coconut Survey attributed this to more intensive harvesting rather than the productivity of palms[5].

10.8 In the 1985 Coconut Survey soil type was classified into three broad categories. 41% of plots lay on sand or coral; 47% on black alluvial soils; and 21% on red clay. It was concluded that the reason for low yields is often area specific but soil nutrient deficiency, notably potassium, is an important factor. Despite this, and high copra prices at the time, the 1974-75 survey found that "fertilizer is only applied when provided under some sort of subsidy scheme" and that "smallholder farmers will not buy fertilizer to use on their own plots. There is generally a lack of understanding of the use of fertilizer by farmers, and in many cases a reluctance to use it even when it is provided at a subsidised price"[5].

10.9 Other important factors identified in the 1985 Coconut Survey as affecting production were pests and disease. Over half the plots sampled in the 1985 suffered from Leaf Spot, which may refer to the symptoms of pest infestation or nutrient deficiency. One quarter of plots showed some evidence of White Thread, but it was felt that neither problem significantly affected output. About 40 ot 50 percent of plots were felt to be disease free[7].

10.10 Amblypelta cocophaga appeared to be a significant pest in parts of Western province, the Floridas, Guadalcanal and Malaita. **38%** of households reported premature nutfall which is linked to Amblypelta in certain localities. Brontispa spp was also evident, and minor pests included rhinoceros beetle (Scapanes australis), rats, cockatoos, flying foxes and others[7].

10.11 The coconut survey of 1985 found that the average spacing of 7.5metres for palms was not significantly different between triangular and square planted plots. On customary plantings there was a wide variation in planting density, but the majority of plots were similar to disciplined plantings[7].

10.12 The 1974-75 sample survey of agriculture found that more than half of all immature palms were well maintained. Among bearing trees more than **60%** of disciplined plantings were well maintained compared to **47%** of customary planted palms[5]. The 1985 coconut survey found lower management standards, and that even with **30%** of farmers hiring workers to assist with maintenance only **39%** of plots were well brushed. **47%** revealed weed growth to shoulder height, and **13%** of plots were totally neglected[7]. The relationship between levels of maintenance, yield and soil conditions was not established in the 1985 survey.

10.13 Table 10.2 presents additional results from the present study. 24 plots of coconuts in pure stand are recorded, but cocoa was not encountered in the survey.

10.14 Maintenance standards in the survey area are high, with most plots brushed at least to shoulder height. **4%** of plots undercropped (ie new plantings in food gardens), **63%** are brushed to ground level, **29%** are brushed to shoulder height and only **4%** have a ground cover of secondary bush. Maintenance levels are illustrated in diagram 10.1.

Table: 10.2
COCONUTS AND COCOA

	⟨------- % plots ------⟩		
	coconut	cocoa	coconut + cocoa
i) Intercropping:			
Pure stand	96		
Intercropping with:			
Coconut + cocoa			
Short term cash crops			
Food crops	4		
Livestock			
Total %	100		
Number of observations (plots)	24		
ii) Maintenance:			
Undercropped	4		
Brushed to ground level	63		
Brushed to shoulder height	29		
Secondary bush	4		
Burnt			
Total %	100		
Number of plots	24		
iii) Coconut variety composition			
Tall	93		
Rennel	7		
Dwarf			
Other			
Total %	100		
Number of plots	24		
iv) Coconut age composition			
⟨ 8 years	18		
9 - 16 years	11		
17 - 40 years	71		
⟩ 40 years			
senescent			
Total %	100		
Number of plots	24		

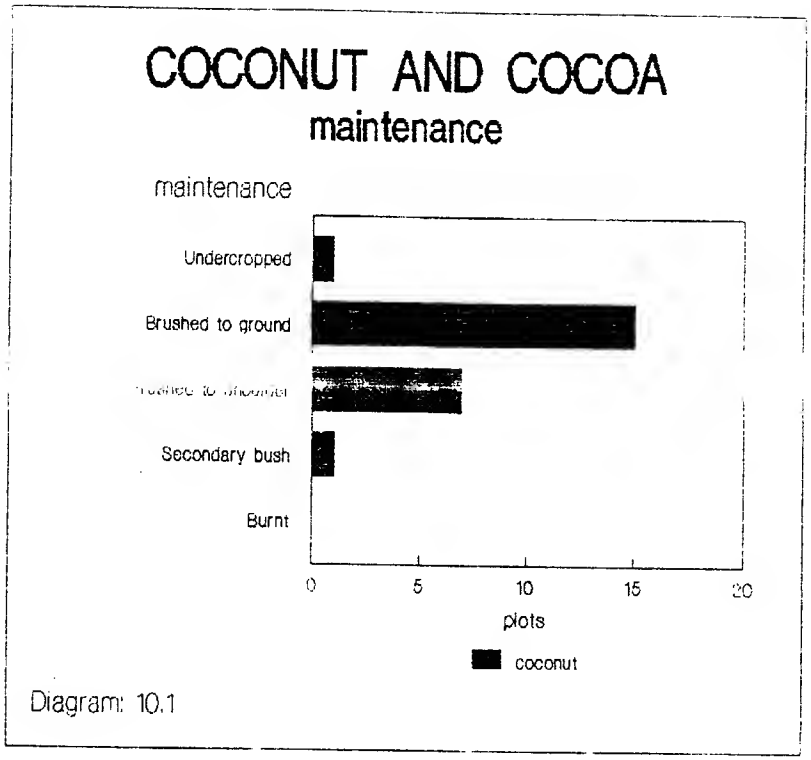


Diagram: 10.1

10.15 In the survey the coconut variety is mainly local tall although **7%** are Rennel palms. **18%** are up to eight years of age, **11%** are 9-16 years and **71%** are 17-40 years of age..

Chapter: 11
FALLOW

11.1 Throughout Solomon Islands almost all gardens are cultivated according to a form of shifting cultivation with bush fallow. In the 1974-75 Sample Survey of Agriculture it was found that, where population density or land tenure problems have restricted the availability of suitable land, the length of fallow may be reduced from the optimum 7 to 20 years to as little as one or two years. In such areas soil fertility is diminished through over frequent cropping[5].

11.2 Solomon Islands soils generally have a low to very low potassium status. The geology of the country is composed in the main of rocks which are low in potassium bearing minerals, and potassium is readily leached under conditions of continuously high rainfall and rugged topography. Fallow is essential for the restoration of potassium fertility: "Under traditional shifting cultivation the depletion of potassium by crops is gradually reversed over a period of 3-15 years or more by a combination of mineral weathering and root systems incorporating potash in the nutrient cycle". Although burning leads to an erratic distribution of potassium in the topsoil, "the burning of vegetative trash is beneficial and it has been shown that topsoil potassium is increased by as much as 100% on average after burning, all of this increase being held by the exchange complex"[9].

11.3 Research on Malaita has shown that the average tuber yield of sweet potato is **9.3t/ha** on sites of more than 10 years of fallow, falling off rapidly to **6.0t/ha** on land of 5 - 9 years of fallow; **4.8t/ha** on land of 0 - 4 years of fallow; and 3.5t/ha on successively cropped land. A residual yield of 2 - 6t/ha "seems to represent the rate of release of potassium from slowly available reserves in soil and weathering parent material within rooting depth". Large amounts of fertiliser are required to restore yields. A supply of 112kg/ha K is only marginally beneficial and inadequate to replenish the rate of potassium removal by the crop. 200 to 300kg/ha K is said to be required to restore yields to levels commensurate with long fallow periods[9].

11.4 Phosphorus varies widely in its total and available forms, but Solomon Islands soils generally have low levels in the subsoil and medium levels of total phosphorus in the topsoil. Most soils used for agriculture have satisfactory levels of phosphorus but as land pressure increases deficiencies may become more widespread. Humus in the topsoil is accompanied by an increase in phosphorus, mainly in organic form, which may become readily available[9].

11.5 Soil total nitrogen levels are generally adequate, with C:N ratios in the range 7-13 signifying the ready availability of nitrogen. Topsoil nitrogen is dependent on land use and in particular the length of fallow since there is a build-up of topsoil nitrogen under secondary regrowth. Sulphur is similarly associated with organic matter, and is higher under forest than under burned grassland[9].

11.6 There is a close relationship between pH and organic matter. The lower the pH the greater the surface organic matter and the higher the subsoil organic carbon content. Difficulties associated with low pH such as aluminium toxicity are only likely to be widespread in the New Georgia group and possibly Ysabel. Alkaline soils are fairly widespread and are associated with reef limestone. The chief problem induced by alkaline calcareous soils is lime induced chlorosis of foliage which results from deficiencies of iron, manganese, zinc and copper[9].

11.7 In addition there is a close relationship between soil depth and soil fertility. "All stable sites tend to favour an accumulation of maximum weathered material due to minimal losses by surface erosion. Thus there arises the paradox that on stable hill sites and terraces the soils tend to be deepest but least fertile, while on adjacent steep slopes the soils are relatively unweathered, and hence fertile, but shallow"[9].

11.8 The shifting system of smallholder agriculture in Solomon Islands is suited to the environment and prevailing management where land pressure is low. Soil fertility is restored during fallow periods, and small isolated areas of mixed cropping are not conducive to pest build-up. Burning of surface vegetative trash not only releases a flush of nutrients, of which the most important is potassium, but is also a useful phytosanitary measure which destroys weed seeds, some insects and undesirable pathogens[9].

11.9 An analysis of fallow therefore tells much about the dynamics of smallholder agriculture, and likely pressures on farming systems. Hansell and Wall[10] state that "there is little doubt that the major factor influencing the decision to abandon the garden is the decline in crop productivity but the exact causes of the decline are not fully understood". The greatest decline in production is between the first and second crops, rather than between the second and subsequent crops. They estimate that despite reduced yields there is still a good return from a low input of labour and conclude that reduced yields alone is insufficient reason for the abandonment of a garden. An important consideration may be the build-up of soil-borne plant diseases causing the rotting of corms or tubers, insect attack and weed infestation[10].

11.10 In the 1974-75 Sample Survey of Agriculture[5] it was stated that, while in overall terms Solomon Islands cannot be said to be suffering from land pressure, it may occur in some areas. Table 11.1 shows the distribution of garden land by the length of the bush fallow in 1975.

Table: 11.1
LENGTH OF BUSH FALLOW (1975)

length of bush fallow (years)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
	% observations				
< 2	23	6	17	16	14
2 - 4	20	5	33	14	18
5 - 7	4	11	25	12	15
8 - 10	10	10	8	15	10
> 10	13	20	3	14	13
never previously cultivated	29	48	15	29	32
Mean length fallow (years)	5.6	9.2	4.5	6.7	6.4

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.11 Table 11.2, also from the 1974-75 survey, shows the distribution of garden land by length of cultivation.

Table: 11.2
LENGTH OF CULTIVATION (1975)

length of cultivation (months)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
		% observations			
< 4	20	45	11	19	27
4 - 6	62	31	36	22	37
7 - 9	12	13	25	33	19
10 - 12	5	8	14	18	10
> 12	2	4	14	8	7
Mean cultivation (months)	5.1	4.7	7.6	7.2	6.0

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.12 In 1975 it was found that 32% of gardens in Solomon islands had never been previously cultivated, and that the average length of bush fallow of cultivated gardens was 6.4 years. Only 7% of gardens were generally cultivated for more than 12 months before reverting to fallow, and the average length of cultivation of food gardens was 6 months.

11.13 Table 11.3 summarises cropping intensity in the survey area. The crop period is shown in the first column, which is the time from planting to harvest for the named crop.

Table: 11.3
CROPPING INTENSITY

crop type		harvest to harvest (months)	number of crops in sequence	number of cases (obs)
all crops		6.1	2.5	132
coconut	b	9.5	1.2	22
cabbage	g	1.0	4.0	1
vegetable	h	2.4	2.3	7
banana	l	9.0	3.0	1
nut trees	n	6.0	1.0	1
tobacco	q	4.0	3.0	1
sweet potato	r	3.5	2.8	46
taro	s	6.5	2.9	14
yam	t	8.7	2.5	10
pana	u	7.5	2.7	29

11.14 The second column describes the number of times an area is cropped in sequence before reverting to fallow. This introduces complexity since the crop type may, and commonly does, change within the sequence. The table therefore shows different stages in the cropping sequence. The dominant root crops are sweet potato, taro, yam and pana with 99 observations.

11.15 Table 11.4 describes the fallow period, however this has little meaning for tree crops since the interpretation of fallow varies with the age of the tree crop and previous cropping history. For food crops the fallow period relies on the knowledge of the respondent. Often it is found that long fallow periods are beyond the memory of operators and these are referred to as "cases longer than memory". 90% of gardens have such long fallows. Where the fallow period is known on food gardens there are 2.8 years of fallow between cropping.

Table: 11.4
FALLOW PERIOD (years)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
mean years of fallow		1.0		2.3	2.4
standard deviation (years)				3.5	3.1
number of cases (gardens)		2		6	8
cases longer than memory					70
total cases (gardens)					78

11.16 Fallow periods cover a range of soil and site conditions, and are themselves variable. Table 11.5 shows that **90%** of fallow periods on food gardens are longer than memory, extending over essentially the entire food garden area.

Table: 11.5
FALLOW RANGE

i) Fallow Range by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow					
1 year		2		3	5
2 years				2	2
3 years					
4 years					
5 years					
6 - 10 years				1	1
11 - 20 years					
21 - 50 years					
beyond memory ("long time")		19		51	70
total by crop type		21		57	78

ii) Fallow Range by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow		15			15
1 year					
2 years					
3 years					
4 years					
5 years					
6 - 10 years					
11 - 20 years					
21 - 50 years					
beyond memory ("long time")		67		19	85
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

11.17 The type of fallow in the survey area is shown in table 11.6.

Table: 11.6
FALLOW TYPE

i) Fallow type by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		20		15	35
secondary forest		1		37	38
dense thicket					
open scrub grassland				1	1
grassland				2	2
plantation trees/planted					
other fallow				2	2
total by crop type		21		57	78

ii) Fallow type by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		77		8	85
secondary forest		4		12	15
dense thicket					
open scrub grassland					
grassland					
plantation trees/planted					
other fallow					
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

11.18 **94%** of all gardens have a fallow of primary or secondary forest extending over essentially the entire cultivated area.

11.19 **42%** of the food garden area is cut from primary forest compared with **95%** of the tree area. Since tree areas are semi-permanent while annual cropping is constantly shifting, the encroachment of food gardens on the primary forest may be relatively rapid with respect to the area under annual crops.

11.20 Table 11.7 summarises the application of agricultural inputs for the control of pests and maintenance of soil fertility. In the survey no application of inputs was encountered.

Table: 11.7
MANAGEMENT AND APPLICATION OF AGRICULTURAL INPUTS

i) Inputs by frequency of use (gardens)

crop type		row planting	fert-iliser	pest-icide	compost	ash	other	frequency of plots
all crops		28						134
coconut	b	18						24
cabbage	g							1
vegetable	h	6						7
banana	l							1
nut trees	n							1
tobacco	q							1
sweet potato	r	3						46
taro	s							14
yam	t							10
pana	u	1						29

ii) Inputs by % area applied

crop type		row planting	fert-iliser	pest-icide	compost	ash	other
all crops		70					
coconut	b	70					
cabbage	g						
vegetable	h						
banana	l						
nut trees	n						
tobacco	q						
sweet potato	r						
taro	s						
yam	t						
pana	u						

Note: The table of % area is only approximate due to rounding small numbers

Chapter: 12
LANDFORM

12.1 The survey area is among the coastal villages of Graciosa Bay and Nemya Bay on Nendo Island of Temotu Province. It is characterised by generally narrow coastal lowlands, a steep hill escarpment which rises to an extensive plateau, and moderate relief.

12.2 Landforms are broadly subdivided into "lowland" and "upland" where "upland" simply means above the coastal plain or coastal terrace, but does not imply high elevation. Table 12.1 shows the distribution of cultivated land in the survey by landform. The first part of the table records the number of observations (gardens) which is expressed in area terms in the second part of the table.

12.3 **52%** of tree gardens representing **41%** of the tree garden area are on lowland sites, with the remainder on the plateau. **18%** of food crop gardens representing **21%** of the food garden area are on lowland sites, the remainder again on the plateau.

Table: 12.1

LANDFORM

i) Landform by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach		1			1
lowland plain		8		8	16
depression (poor drainage)					
swamp		2			2
river channel					
uplifted terrace				2	2
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees				3	3
hill slope 8 - 30 degrees					
hill slope > 30 degrees				1	1
ridge (plateau)		10		43	53
total by crop type		21		57	78

ii) Landform by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach					
lowland plain		26		4	30
depression (poor drainage)					
swamp		7			7
river channel					
uplifted terrace					
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees					
hill slope 8 - 30 degrees					
hill slope > 30 degrees					
ridge (plateau)		48		15	63
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

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swamp		2			2
river channel					
uplifted terrace				2	2
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees				3	3
hill slope 8 - 30 degrees					
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ii) Landform by % cultivated area

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depression (poor drainage)					
swamp		7			7
river channel					
uplifted terrace					
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees					
hill slope 8 - 30 degrees					
hill slope > 30 degrees					
ridge (plateau)		48		15	63
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

12.4 A summary of landform and cropping is illustrated in diagram 12.1.

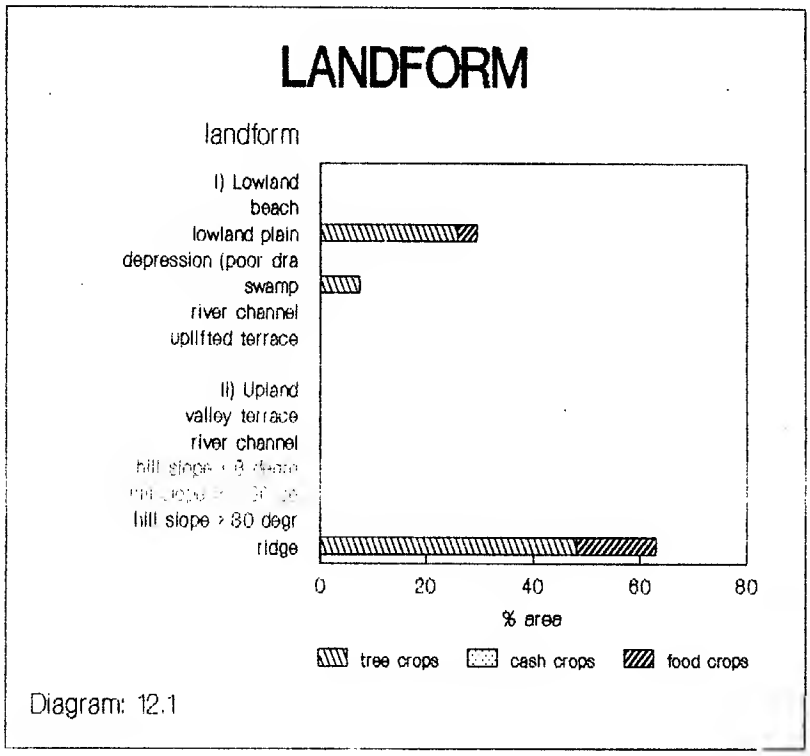


Diagram: 12.1

12.5 Table 12.2 describes the characteristics of slope in farming systems. The first part of the table records the frequency of observations (plots) which is expressed in area terms in the second part of the table.

12.6 Generally there is no slope, although some minor crops are planted on the escarpment. For the most part crops are on the level coastal plain or on the mainly flat plateau.

Table: 12.2

SLOPE

i) Slope by number of observations (gardens)

crop type		mean slope (degrees)	frequency of plots at different degrees of slope						frequency of plots
			0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	› 50 degrees	
all crops		1	131	2			1		134
coconut	b	0	24						24
cabbage	g	6		1					1
vegetable	h		7						7
banana	l	45					1		1
nut trees	n	5	1						1
tobacco	q		1						1
sweet potato	r	0	45	1					46
taro	s	1	14						14
yam	t		10						10
pana	u	0	29						29

ii) Slope by % cropped area

crop type		frequency of plots at different degrees of slope						total
		0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	› 50 degrees	
all crops		100						100
coconut	b	81						81
cabbage	g							
vegetable	h							
banana	l							
nut trees	n							
tobacco	q							
sweet potato	r	7						7
taro	s	4						4
yam	t	4						4
pana	u	4						4

Note: The table of % area is only approximate due to rounding small numbers

12.7 Table 12.3 summarises conservation measures. No conservation practices or alley cropping were encountered in the survey.

Table: 12.3
CONSERVATION AND ALLEY CROPPING

i) Conservation by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		21		57	78
ii) Alley cropping not performed performed		21		57	78
total by crop type		21		57	78

ii) Conservation by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		81		19	100
ii) Alley cropping not performed performed		81		19	100
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

12.8 The spatial distribution of gardens is shown in diagrams 12.2 to 12.4, which illustrate the relationships between crop type, crop area, and the distance of gardens from households.

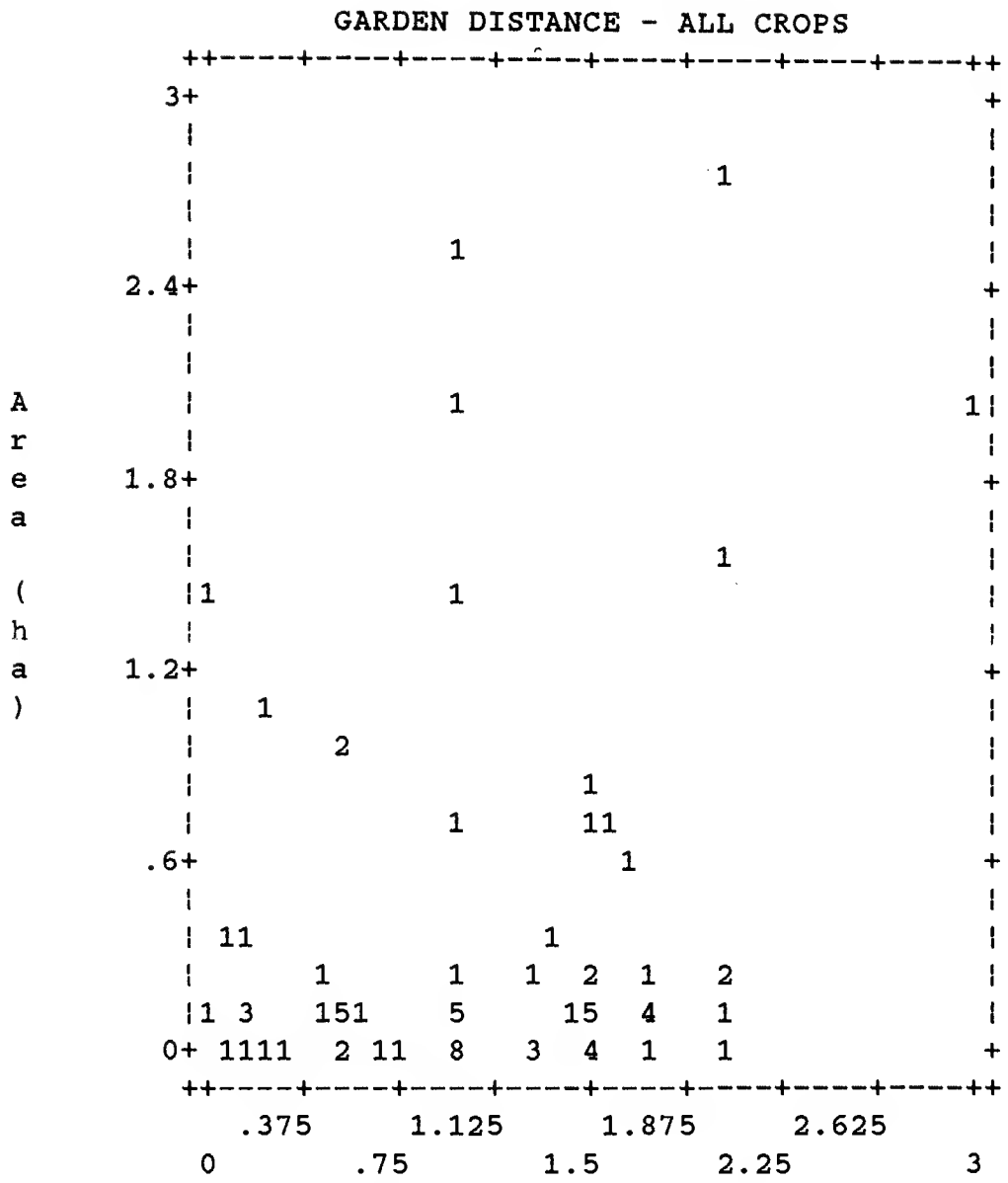
2.9 Diagram 12.2 is the graph of gardens for all crops, while subsequent diagrams show the distance relationships for the major crop types. The graph shows the relationship between garden area (vertical axis) and the time taken to reach the garden from the household (horizontal axis). Graph entries represent the number of observations (gardens) and are numbered from 1 to 9 and thereafter alphabetically. Thus where points coincide the number of points is shown: 9 occurrences is recorded as "9"; 10 occurrences as "A"; 13 occurrences as "D"; and so on.

12.10 The mean time taken to reach gardens is about one hour. The largest gardens tend to be furthest away.

12.11 Diagram 12.3 shows the relationship between distance and area of tree crop gardens. The mean time taken to reach tree crop gardens from the household is again about one hour, with a maximum recorded time of 3.00hrs.

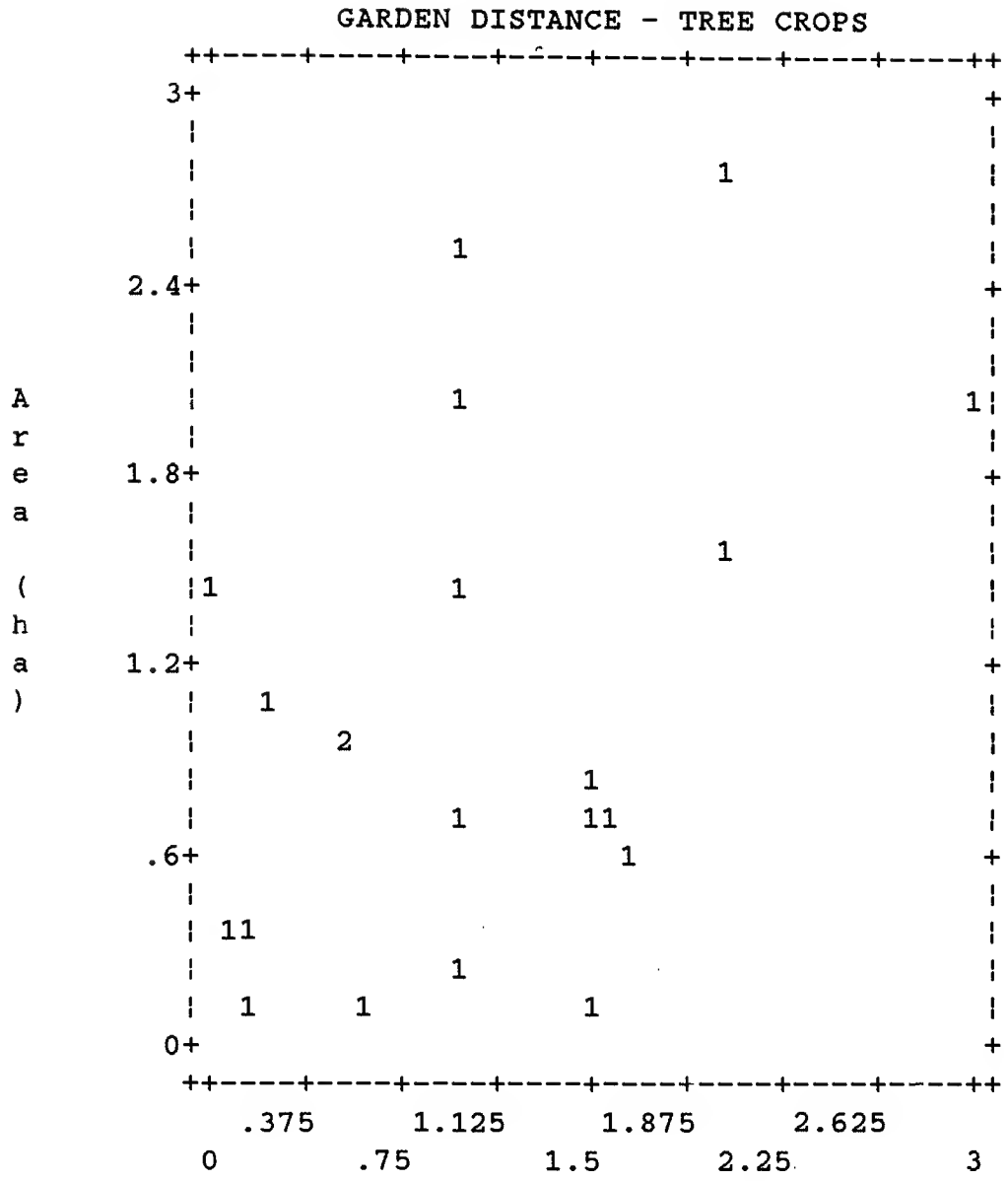
12.13 The mean time taken to reach food gardens from the household is the same, with a maximum time of 2.00 hours.

Diagram: 12.2



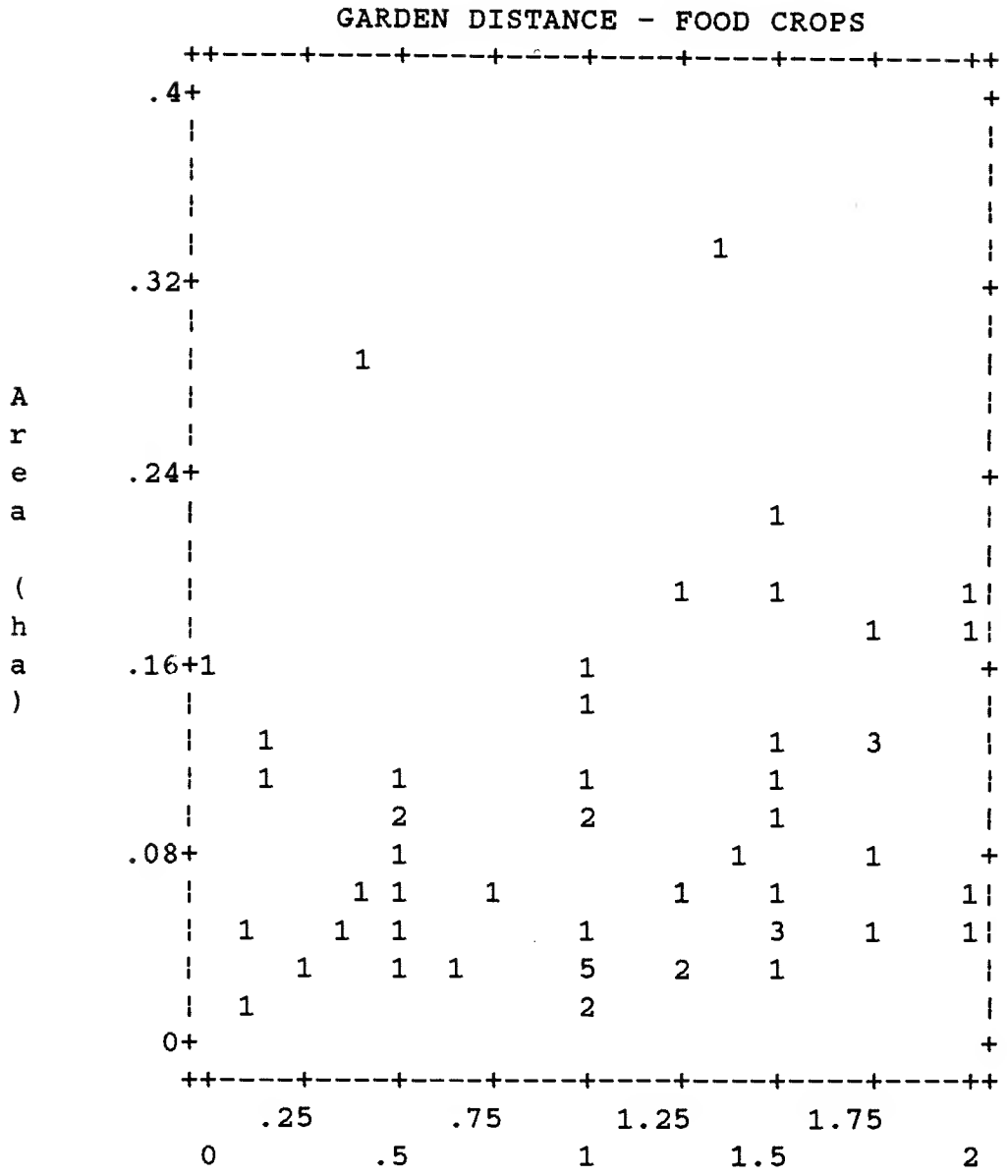
Mean = .947 hrs
Max = 3.00 hrs
Number of observations (gardens) = 78

Diagram: 12.3



Mean = .952 hrs
Max = 3.00 hrs
Number of observations (gardens) = 21

Diagram: 12.4



Mean = .945 hrs
Max = 2.00 hrs
Number of observations (gardens) = 57

Chapter: 13
ADVERSE FACTORS AFFECTING PRODUCTION

13.1 Table 13.1 describes site factors which farmers regard as problems. The first part of the table specifies the number of observations (gardens), which is expressed as the proportion of cultivated area affected in the second part of the table.

Table: 13.1
SITE CONDITIONS

i) Site Conditions by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		10		41	51
poor soil/site		1		4	5
pest/disease problem		6		11	17
poor site + pests					
weed problem		2			2
weeds + poor site					
weeds + pests		2			2
weeds + site + pests				1	1
total by crop type		21		57	78

ii) Site Conditions by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		24		14	38
poor soil/site				3	3
pest/disease problem		31		3	34
poor site + pests					
weed problem		10			10
weeds + poor site					
weeds + pests		14			14
weeds + site + pests					
total by crop type		79		21	100

Note: The table of % area is only approximate due to rounding small numbers

13.2 **65%** of all gardens (51 gardens) representing **38%** of the cultivated area have no apparent site limitations. Site problems may be summarised by grouping the main factors as follows:

	% gardens	% area
No site limitations	65	38
Poor soil/site	6	3
Pests/disease	20	48
Weeds	5	24

Site conditions are illustrated in diagram 13.1.

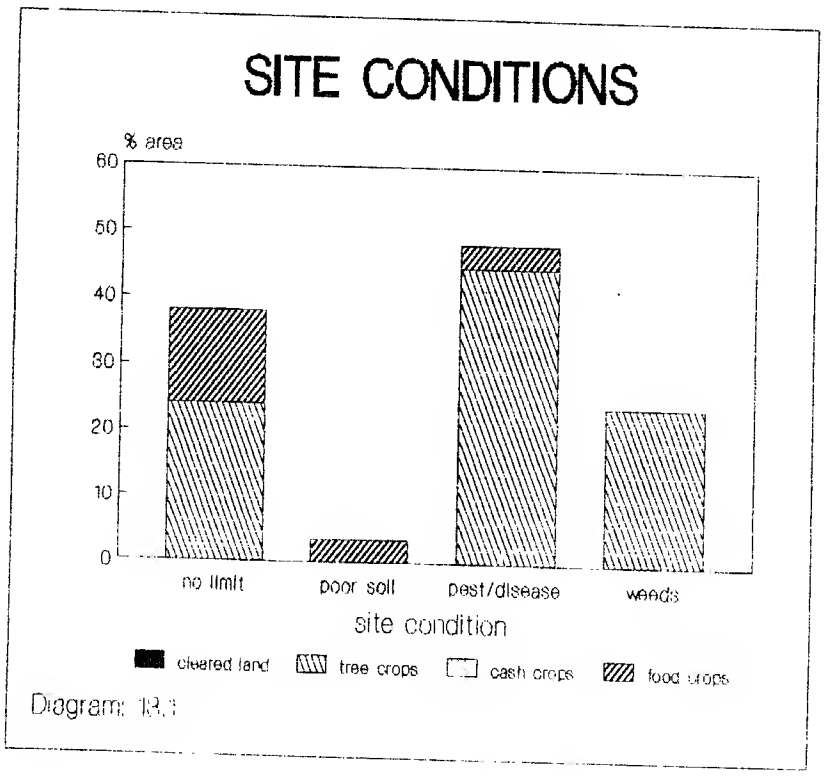


Diagram 13.1

13.3 The major problems are predominantly on tree crops. Pests and disease affect **48%** of the cultivated area and weeds affect **24%** of the cultivated area. Soil and site problems are encountered only over small areas.

13.4 Table 13.2 describes major crop damage Cyclone damage on tree crops affects **5%** on **14%** of the tree crop area. A variety of "other factors" affect **22%** of gardens over **22%** of the cropped area.

Table: 13.2
CROP DAMAGE

i) Crop Damage by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		16		43	59
cyclone damage		1		1	2
other damage		4		12	16
cyclone and other damage				1	1
total by crop type		21		57	78

ii) Crop Damage by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		56		11	67
cyclone damage		11			11
other damage		15		7	22
cyclone and other damage					
total by crop type		81		19	100

Note: The table of % area is only approximate due to rounding small numbers

13.6 Annex 3 provides a more detailed description of factors damaging crop mixtures, summarised at the plot level. It is not possible at this stage to present results at the crop level. Results are summarised in table 13.3 and are illustrated in diagram 13.2.

Table: 13.3
SUMMARY OF CROP DAMAGE

nature of damage		% cropped area affected
insects affecting	leaves	11
	fruits	
	roots	
disease affecting	leaves *	33
	fruits	
	roots	
damage due to	humans	
	fire	
	flood	
	wind	11
	rats	
	birds	4
	bats	4
	livestock	
	other	

Note: "disease" affecting leaves is mainly the coconut leaf miner Promecotheca spp

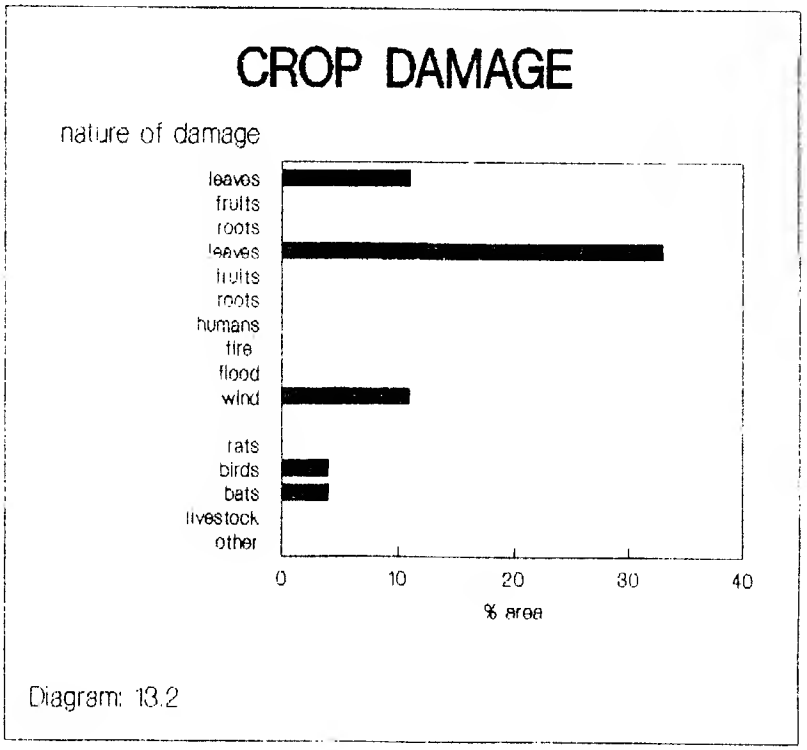


Diagram: 13.2

Chapter: 14
CROP YIELDS

14.1 Production data on smallholder agriculture are scarce, largely due to practical difficulties associated with measuring yields in complex cropping systems that lack clear temporal and spatial boundaries. Smallholder agriculture is a continuous process in which there is little seasonality, so that any or all stages of crop growth and management operations may be exhibited at any time, with crops commonly harvested selectively over time. Table 14.1 summarises the planting characteristics of smallholder crops in the survey area.

Table: 14.1
CROP VARIETY AND SPACING

crop type		number of observations	% improved	spacing (% obs) customary	regular	recommended (tree crops) triangular	square
Cleared	Cleared land						
Coconut/Cocoa	Coconuts	27	11	22	30	15	33
	Cocoa						
Ground crops	Grain crops	12		100			
	Beans	1		100			
	Cabbage	26		100			
	Vegetable	7		29	71		
	Chillie						
	Fruit Crops	29		100			
Tree/other crops	Fruit trees						
	Banana	48		100			
	Citrus trees						
	Nut trees	9		100			
	Sugar cane	18		100			
	Food/building tree	4		100			
	Tobacco	2		100			
Root crops	Sweet potato	48		98	2		
	Taro Common	20		100			
	Giant	1		100			
	Hong Kong	7		100			
	Swamp	1		100			
	Yam	33		100			
	Pana	38		100			
	Cassava	2		100			
	Other root crop						
Total		333					

14.2 The second column refers to the introduction of non-traditional planting material, either through extension or research, or from other sources.

14.3 For non-tree crops there are three types of spacing identified, being "customary", "regular" and "recommended". "Customary" means there is no discernable order in the plot. "Regular" means planting according to a visible pattern, such as in rows. "Recommended" refers to the adoption of recommended practices, which may not necessarily be "regular". For tree crops there are four categories of "customary", "regular", "triangular" and "square". "Customary" and "regular" follow the same rules as non-tree crops. "Triangular" and "square" equate with recommended practices for coconuts.

14.4 Crop mixtures in smallholder farming systems are complex, as seen in table 9.3. Table 14.2 describes something of the the complexity of planting densities. In general around **40%** of root crops are pure stand, but for the most part crops are grown in complex mixtures.

Table: 14.2
CROP DOMINANCE IN MIXTURES

crop type		number of observations	% dominance in mixture									
			0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Cleared	Cleared land											
Coconut/Cocoa	Coconuts	27	7		4				7			81
	Cocoa											
Ground crops	Grain crops	12	58	25		8	8					
	Beans	1	100									
	Cabbage	26	73	19			8					
	Vegetable	7										100
	Chillie											
	Fruit Crops	29	83	14	3							
Tree/other crops	Fruit trees											
	Banana	48	81	15	4							
	Citrus trees											
	Nut trees	9	56	22			11		11			
	Sugar cane	18	89	11								
	Food/building tree	4	50	25	25							
	Tobacco	2	50	50								
Root crops	Sweet potato	48	4				6	8	6	19	17	40
	Taro Common	20	25	20	10						5	40
	Giant	1	100									
	Hong Kong	7					14		14	14	14	43
	Swamp	1			100							
	Yam	33	3	9	18	27	36				6	
	Pana	38	3		3	16	37	18	5	5	5	8
	Cassava	2	50	50								
	Other root crop											
Total		333										

14.5 A visual assessment of yields is presented in table 14.3.

Table: 14.3
CROP PRODUCTION

crop type		number of observations	yield appearance (% obs) zero	low	moderate	high
Cleared	Cleared land					
Coconut/Cocoa	Coconuts	27		33	30	37
	Cocoa					
Ground crops	Grain crops	12		25	67	8
	Beans	1			100	
	Cabbage	26		19	8	73
	Vegetable	7		29	71	
	Chillie					
	Fruit Crops	29	3	10	48	38
Tree/other crops	Fruit trees					
	Banana	48	2	21	42	35
	Citrus trees					
	Nut trees	9		22	22	56
	Sugar cane	18		6	28	67
	Food/building tree	4		25	25	50
	Tobacco	2		50	50	
Root crops	Sweet potato	48		10	58	31
	Taro Common	20	5	5	20	70
	Giant	1			100	
	Hong Kong	7		29	14	57
	Swamp	1				100
	Yam	33		6	3	91
	Pana	38	3	5	11	82
	Cassava	2				100
	Other root crop					
Total		333				

14.6 Crop yields are variable but for the most part are moderate to high.

14.7 In an intensive case study of this kind it is difficult to obtain a reasonable coverage of crop yields, although these are recorded where possible in the course of the survey[12]. A crop production study has been designed to generate yield data[22] but it has not been possible to implement this yet. For the present report yields are largely derived from secondary sources.

a) COCONUT:

14.8 Coconut production data from the 1974-75 agricultural survey are summarised in table 14.4.

Table: 14.4
COCONUT PRODUCTION DATA FROM 1974-75 AGRICULTURAL SURVEY

	Province				Mean
	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
number of yield sites	28	32	3	30	93
coconuts per palm: disciplined	53	54	19	34	44
customary	22	36	1	41	31
mean	31	42	14	37	36
coconuts per ha : disciplined	8,194	8,383	2,822	5,773	7,178
customary	4,658	8,595	135	7,432	6,703
mean	5,794	8,753	1,926	6,492	6,913
% damaged/unusable nuts: disciplined	12	10	12	20	14
customary	19	13	36	6	13
mean	16	12	12	13	14
gross copra yield (kg/ha): disciplined	1,541	1,689	531	1,086	1,450
customary	876	1,616	25	1,398	1,261
mean	1,081	1,646	362	1,221	1,300
net yield (kg/ha): disciplined	1,356	1,520	467	869	1,247
customary	709	1,406	16	1,314	1,097
mean	908	1,448	318	1,062	1,118

Source: Statistics Office (1978) "1974-75 Agricultural Statistics Survey".
Note: Copra yields assumse 190gm dried copra per nut quoted in the Statistics Office report

14.9 In the 1974-75 agricultural survey the mean coconut yield is estimated to be 1,300kg/ha copra equivalent, or 1,118kg/ha when unusable nuts are discounted. The average daily consumption of coconuts was found to be 4.2 per household, resulting in a national annual consumption equivalent of 8,871MT copra. If green nuts are taken into account it was believed that the copra equivalent consumed would be 10,000MT[5] in a year when exports amounted to 28,000MT.

14.10 Charles (1980) estimates lower levels of copra production with estate yields of 827kg/ha and smallholder yields of 410kg/ha The difference he attributed to a high proportion of immature plantings and the consumption of coconuts in the smallholder sector[23]. Average copra production derived from the 1985 coconut survey is estimated in the (draft) Farm Management Handbook for Solomon Islands to be 0.72MT/ha[24], although provincial yields vary from 1.15MT/ha in Central Province, which is dominated by the Levers plantation in the Russel Islands, to 0.38MT/ha in Temotu.

14.11 In conjunction with the 1985 coconut survey the Research Department of the Ministry of Agriculture and Lands has analysed the nutritient status of coconut soils soils in Solomon Islands[13]:

Coconut Soils Data:
(means of soils analyses conducted on Coconut Survey soils)

pH	N%	available P ppm	exchangeable K meq/100g	available K meq/100g
6.4	0.55	70	0.24	0.60

14.12 It was concluded that coconut soils are generally high in nitrogen, medium in phosphate, and low in potassium. Recent variety experimental results on fertilised coconuts show the following yields:

Coconut Research Results (dry copra eq kg/ha):

Site	Tenaru (Guadalcanal)		Gizo (Western)	
Year	1985	1984	1985	1984
Dwarf:Rennel Hybrid	378	2,664	1,990	1,599
Dwarf:Local Tall Hybrid	383	1,391		
Local Tall			1,830	334
Rennel	190	1,391	1,910	1,052
Mean				995

14.13 19 smallholder yields were obtained in the present survey resulting in a mean yield of **715kg/ha** (10.22 bags/ha). Smallholder yields in the present report are estimated to be **800kg/ha** dry copra equivalent usable nuts.

b) <u>COCOA</u>:

14.14 Research trials on cocoa[13] from 1977 to 1985 at Black Post in Guadalcanal produced a mean dry beans yield of **1,898kg/ha** for Amelonado, **2,780kg/ha** for AmlxNa33 hybrid, and **2,444kg/ha** for AmlxPa7 hybrid.

14.15 Cocoa yields from various sources are quoted in the (draft) Farm Management Handbook for Solomon Islands[24]:

Smallholder Cocoa Yields (kg/ha)[24]:

Age of tree (year)	3	4	5	6	7	8
Friend (1970)	21	126	215	220	220	173
DBSI (1983) *	150	250	600	1,200	1,450	1,450
Hiele (1988)	208	450	560	685	719	719

* unverified source

14.16 High variability in yields was attributed to differences in management, such as in the application of fertiliser, weeding, and pest and disease control.

14.17 No cocoa was encountered among sampled farmers. Smallholder cocoa yields are estimated in the present report to be **600kg/ha** dry beans.

c) **SWEET POTATO:**

14.18 In a study of north-west Malaita, Frazer[15] investigated the effect of fallow period on smallholder sweet potato yields. After a long fallow of 15-20 years the mean yield was found to be **14.84MT/ha** from 8 observations. After a "short" fallow of less than 10 years the mean yield was **8.99MT/ha** from 5 observations. Gollifer[16] looked at the effects of potassium and nitrogen application on annual crops on soils of the Dala Series in Malaita, soils formed on a parent material of raised coral reef and characteristically low in potassium. He found unfertilised sweet potato yields of **5.5MT/ha** (control for K) and **7.4MT/ha** (control for N). The effect of potassium application was to increase yields by up to 86%, but nitrogen tended to stimulate vine growth at the expense of the tuber.

14.19 In a series of trials at Dala, Gollifer[17] found unfertilised sweet potato yields to range widely, from around **0.25MT/ha** to **24MT/ha**. Yields in general were the order of **5MT/ha**, which was estimated to be around half the typical North West Guadalcanal yield of **9.97MT/ha**. Yield variability could not be attributed to variety or soil type, but a trend related to intensity of cropping did appear:

Effect of Recent Land History on Sweet Potato Yields (MT/ha):

land history	yield (MT/ha)
continuous cropping	3.51
0 - 4 years fallow	4.77
5 - 9 years fallow	6.03
more than 10 years fallow	9.29

Source: Gollifer (1969)

14.20 It was concluded that sweet potato and other root crops are demanding of, and remove large quantities of, potassium from the soil. A fallow-burn cycle is therefore essential to replenish soil fertility by making potassium available to shallow-rooted crops. It was considered that deep rooting trees may act as nutrient pumps, but the only practical way of shortening fallow periods was considered to be the application of potassium fertiliser[17].

14.21 Bathgate[18] found also that yields vary according to soil fertility and growing time, as well as species and density of planting. In West Guadalcanal he quotes sweet potato yields of **7.16MT/ha** after 20 years of fallow and **9.36MT/ha** after 8 years of fallow, but based on a single sub-plot observation only in each case.

14.22 On the weather coast of Guadalcanal Chapman and Pirie[19] studied the relationship between yields and cropping, and found yields to be high in comparison to studies elsewhere:

Sweet Potato Yield (MT/ha) - Weather Coast, Guadalcanal

successive crops	Ghauvalisi	Sughu	Hatare/Poinaho
1	41.67	18.08	17.82
2	15.31	10.54	9.79
3		10.29	9.79

Source: Chapman and Pirie (1974)

14.23 In the 1974-75 Agricultural Survey[5] the mean yield of sweet potato was **15.7MT/ha**, but this was felt to be an over-estimate.

14.24 More recent research provide further information on sweet potato yields, but results exhibit considerable variability across seasons and due to other causes:

trial	yield MT/ha		notes
	gross	marketable	
improved cultivars	17.9	14.5	25 obs
control	11.2	6.7	1 obs
dry season corn intercropping	15.9	7.1	135 days to harvest
	18.5	12.0	165 days to harvest
wet season corn intercropping	5.9	1.5	135 days to harvest
	11.0	3.4	165 days to harvest
dry season weevil control	15.3		no effect from insecticide
wet season weevil control	8.19	6.37	

Source: Research Department Annual Report 1984[14] and 1985[13]

14.25 One yield observation on sweet potato during the present survey provided a low yield of **1,081kg/ha.**

14.26 Smallholder sweet potato yields of usable crop are estimated in the present report to be **8MT/ha** under long fallow of 8 years or more - falling to **5MT/ha** for fallow of 4 to 8 years, and **3.5MT/ha** for short fallow cropping.

d) <u>TARO</u>:

14.27 Taro yields in the literature are highly variable. Frazer[15] found <u>Colocasia esculenta</u> to yield **8.94MT/ha** in North Malaita, based on 10 observations. Gollifer[16] on the Dala Series in Malaita found yields of **4.0MT/ha** for unfertilised taro, which increased to **6.0MT/ha** with 168kg/ka potassium fertiliser applied. Gollifer[17] also quotes widely ranging unfertilised taro yields of **1.00 to 10.80MT/ha** on experimental plots. In a spacing trial in Guadalcanal at Tenaru on which fertiliser was applied, the net undamaged taro yield for densities of 2,000 to

4,000 plants/ha was around 5MT/ha, with 30% loss due to corm damage[14]. On the same site a high intensity inputs and management trial to investigate leaf blight yielded around **9MT/ha** marketable corms[14]. The control yield in a 1985 taro beetle trial at Tenaru was **3.49MT/ha**[13]. Tioti (1967) estimated taro yields to be **12.6MT/ha**[25], but Gollifer (1970) quotes yields of **4.7MT/ha**[26].

14.28 One Hong Kong taro yield was obtained in the present survey of **30,357kg/ha** but was based on 8.5kg harvested from 2.78sq m. Smallholder taro yield in the present report is estimated to be **5MT/ha.**

e) **YAM:**

14.29 In North Malaita Frazer[15] found yam yields of **5.16MT/ha** for Dioscorea alata. Gollifer[17] quotes unfertilised yam yields of **6.03MT/ha** to **30.38MT/ha** at Dala experimental station on Malaita. In 1984 an experiment to compare the yields of 18 yam cultivars was conducted at Tenaru in Guadalcanal[14] in which the cultivars with high resistance to dieback yielded around 14 to **18MT/ha**, with the highest resistance cultivar yielding **24MT/ha**. Susceptible cultivars produced yields as low as **2MT/ha**. Maeinia[27] quotes very high yields of **50 - 63MT/ha** for Malaita.

14.30 Smallholder yam yields are likely to be higher than those of sweet potato given that they tend to be planted on newly opened sites and the yield appearance is generally good. Long term fallow is expected to yield **10MT/ha**, fallow of 4-8 years to yield **6MT/ha** and short fallow systems to yield **4MT/ha.**

f) PANA:

14.31 Frazer[15] quotes a for North Malaita, where on one observation only of Dioscorea esculenta produced a yield of 11.52MT/ha. Fertilised cultivar trials at Dodo Creek Research Station[14] in 1984 yielded 16.2MT/ha marketable tubers out of a total yield of 27.7MT/ha. 1983 results were higher, with 43.7MT/ha marketable tubers out of a total yield of 52.9MT/ha. The difference was believed to be due to inadequate fertiliser in 1984. In 1985 the mean fertilised yield of 8 cultivars was 24.3MT/ha marketable tubers[13].

14.32 Five smallholder pana yields were recorded in the present survey, resulting in a mean yield of 6,280kg/ha. In general smallholder pana yields are expected to be similar to yam yields - of 10MT/ha under long fallow, 6MT/ha under 4-8 years fallow, and 4MT/ha under short fallow.

g) CASSAVA:

14.33 Fertilised cassava in a time of harvest trial at Dodo Creek in Guadalcanal[13] yielded 23.8MT/ha after 9 months and 27.8MT/ha after 12 months. In a fertilised germplasm collection trial on the Fataolo land system on Malaita 17 cultivars ranged from 7.5 to 65.8MT/ha, with 50% above 40MT/ha[28].

14.34 Smallholder cassava is generally planted on less fertile sites and is commonly a minor crop in a mixture. It is high yielding, although of low nutritional value. Smallholder yields in the present report are estimated to be 10MT/ha.

h) MAIZE:

14.35 Gollifer[16] quotes unfertilised maize yields of 1.90MT/ha on Dala soils in Malaita, but yields of 5.58MT/ha when fertilised with NPK. Further unfertilised maize yield data from Dala[17] range from 1.55MT/ha to 2.13MT/ha.

14.36 Smallholder maize yields in the present report are estimated to be 1.8MT/ha.

i) GROUNDNUT:

14.37 Gollifer quotes unfertilised groundnut yields in the range 527kg/ha to 1,278kg/ha from Dala in Malaita.

14.38 Smallholder groundnut yields in the present report are estimated to be 600kg/ha.

k) SUMMARY OF YIELDS:

14.39 Crop yields derived fromthe survey and secondary sources are necessarily imprecise because of the complexity of smallholder farming systems. Diverse crop mixtures, with varying crop densities and differing site conditions do not lend themselves to a simple analysis of crop yields or smallholder production. Crop yields in the literature are generally for pure stand crops, or very simple mixtures - under controlled or even modified conditions. There is then a need to study smallholder production under more realistic conditions, as is part of the on-going programme of the Agricultural Economics Section. In the meantime, a "best estimate" of typical smallholder yields in the project area is presented in table 14.5.

Table: 14.5
SMALLHOLDER CROP YIELDS

crop	condition	yield kg/ha
coconut	copra equivalent	800
cocoa	dry beans	600
sweet potato	> 8 years fallow	8,000
	4 - 8 years fallow	5,000
	< 4 years fallow	3,500
taro		5,000
yam	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
pana	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
cassava		10,000
maize		1,300
groundnuts		600

Chapter: 15
SMALLHOLDER PRODUCTION

15.1 Under the Rural Services "Project Benificiary Monitoring and Evaluation" undertaken by the Statistics Office, gross crop offtake and other primary production were measured. Unpublished provisional results, courtesy of the Statistics Office, are presented in table 15.1.

Table: 15.1
DAILY SMALLHOLDER PRODUCTION

Average daily production from entire household (kg):

commodity	Province and Site						
	Ysabel	Central	Guadalcanal	Malaita	Makira	Temotu	Average
	Susubona	Hakama	Marau Sound	Afio	NW Peninsula	Lata	
sweet potato	8.00	2.67	6.68	3.79	4.09	4.19	4.90
cassava	1.26	0.98	2.15	0.35	0.63	0.04	0.90
yam	0.68	1.68	0.71	2.25	0.65	0.90	1.14
pana	0.58	4.60	0.32	0.06	0.34	0.12	1.00
taro	0.71	0.32	0.45	1.60	1.37	1.15	0.93
breadfruit	0.01		0.03	0.01		0.11	0.03
banana	0.55	0.56	1.85	0.83	2.06	0.28	1.02
sub-total	11.79	10.80	12.20	8.90	9.13	6.78	9.93
coconut	0.44	0.49	3.55	1.41	2.54	0.43	1.48
cabbage	0.24	0.26	0.40	0.75	0.71	0.32	0.45
other veg	0.29	0.12	0.24	0.05	0.37	0.08	0.19
other fruit	0.91	0.31	2.01	0.89	1.90	0.41	1.07
fresh meat			0.01		0.01	0.03	0.01
fresh fish	0.69	0.40	0.57	0.32	0.25	0.12	0.39
crab/shellfish	0.58	0.20	0.13	0.23	0.02	0.05	0.20
milk/eggs	0.01				0.00		0.00
betel nut	0.09	0.08		0.16	0.06	0.11	0.08
local tobacco		0.03			0.01	0.01	0.01
Based on observations from the following number of "household days":	1,200	960	480	840	1,200	720	900

Source: Statistics Office PBME unpublished results.

15.2 On average there are **9.93kg** of staple crops produced daily, the crop composition varying according to area and season. Given a national mean household size of **6.50** from the 1986 population census this would provide each man, woman and child with approximately **1.5kg** of staple per day.

15.3 The average household daily production of cabbage is **0.45kg**, other vegetables **0.19kg** and fruit **1.07kg**. Only **0.01kg** of fresh meat is consumed daily in comparison with **0.39kg** (whole) fresh fish and **0.20kg** crabs and shellfish. National coconut consumption is estimated to be **1.48kg** husked unshelled nuts per day, which amounts to an average consumption of **4.26** nuts per household per day according to the mean nut weights in the survey.

15.4 Results from table 15.1 are transformed into annual production in table 15.2 using the simplifying assumption that the survey period is representative of the rest of the year. This is only a first approximation of smallholder yields.

Table: 15.2
ANNUAL SMALLHOLDER PRODUCTION

Average annual production from entire household (kg):

commodity	Province and Site						
	Ysabel	Central	Guadalcanal	Malaita	Makira	Temotu	Average
	Susubona	Hakama	Marau Sound	Afio	NW Peninsula	Lata	
sweet potato	2,919	974	2,439	1,382	1,492	1,528	1,789
cassava	460	357	786	129	231	15	330
yam	247	612	260	823	336	329	418
pana	212	1,677	116	23	123	14	366
taro	259	117	163	584	501	419	341
breadfruit	3		12	4		39	10
banana	201	204	674	304	750	101	372
sub-total	4,302	3,942	4,451	3,249	3,333	2,474	3,625
coconut (kg)	159	179	1,295	515	928	156	539
(nuts)	667	621	1,864	1,508	4,088	427	1,626
cabbage	88	94	145	274	261	117	163
other veg	107	43	87	17	136	28	70
other fruit	331	112	735	325	692	150	391
fresh meat			3		4	10	3
fresh fish	250	145	208	117	90	44	142
crab/shellfish	211	72	49	86	7	19	74
milk/eggs	2				0		0
betel nut	34	27		57	20	41	30
local tobacco		9			4	3	3

15.5 From table 9.2 the average root crop area in the survey area is 0.235ha of which sweet potato is dominant on **0.120ha**, taro on **0.094ha**, pana on **0.018ha** and yam on **0.003ha**. These crops occur in complex mixtures, so that simple cropping patterns can only be used as a first approximation for the actual crop coverage.

15.6 Table 15.3 is a summary of available production data from the farming systems survey and the PBME exercise. It is not possible to directly relate aggregate production data to average cropping patterns until a more detailed detailed analysis of smallholder production is available.

Table: 15.3
SMALLHOLDER PRODUCTION SUMMARY

commodity	area (ha)	growing period (months)	annual production (kg)
sweet potato	0.050	3.5	1,528
cassava			15
yam	0.017	8.7	329
pana	0.039	7.5	44
taro	0.021	6.5	419
breadfruit			
banana	0.008	9.0	101
Source table:	9.2	11.3	15.2

Chapter: 16
LABOUR

16.1 With little or no cash inputs applied the main component in the socio-economy of smallholder agriculture is labour. Table 16.1 presents an overview of labour constraints expressed by farmers. The first part of the table shows the frequency of gardens affected and is expressed in terms of area affected in the second part. Labour constarints are illustrated in diagram 16.1.

Table: 16.1
LABOUR CONSTRAINTS

i) Labour Constraints by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		8		24	32
lack of labour		1			1
lack of inputs/cash					
lack of labour + cash		1			1
garden too far from house		9		32	41
garden too far + labour		1		1	2
garden too far + cash		1			1
too far + labour + cash					
total by crop type		21		57	78

ii) Labour Constraints by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		25		11	36
lack of labour		4			4
lack of inputs/cash					
lack of labour + cash					
garden too far from house		29		11	39
garden too far + labour		11			11
garden too far + cash		11			11
too far + labour + cash					
total by crop type		79		21	100

Note: The table of % area is only approximate due to rounding small numbers

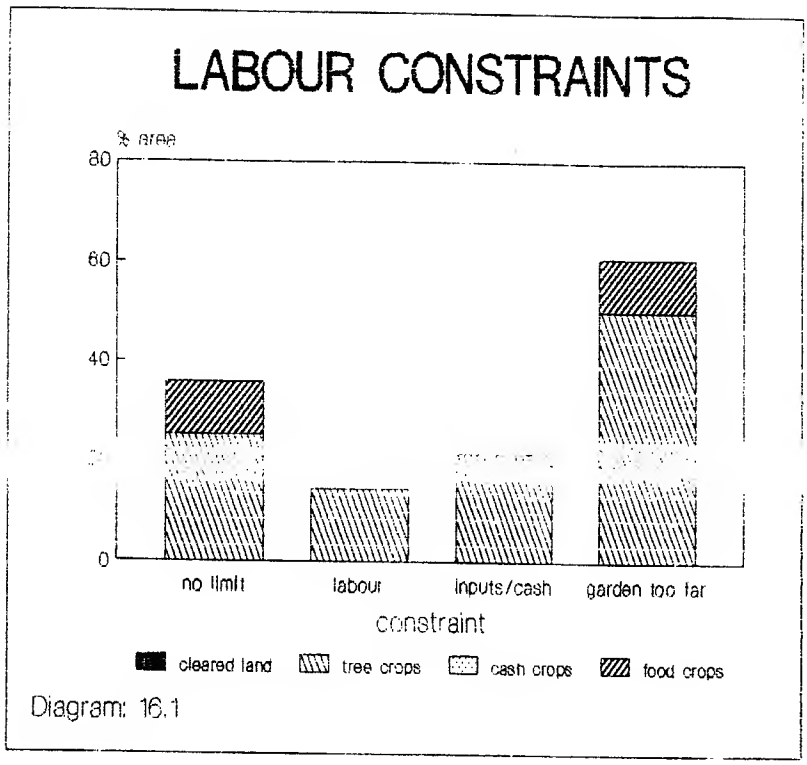


Diagram: 16.1

16.2 The dominant constraints are on tree crops. A labour shortage and a shortage of inputs or cash are recorded on 19% of the tree crop area. In contrast food crop gardens do not have a shortage of labour or inputs. High distances of gardens from households were recorded in chapter 12 and consequently distance of gardens from households is a problem affecting 65% of the tree garden area and 50% of the food garden area.

16.3 Table 16.2 summarises the labour requirements of the average holding, derived from individual plot labour studies presented in annex 2. The table is a "model" budget representing the average of complex and diverse holdings. Individual crop budgets in annex 2 may be used to construct farm budgets for hypothetical holdings, but caution should be exercised where there are few observations. Labour days in budgets presented here are based on actual hours worked per day, which are quite variable. Again, tables in annex 2 may be used to convert work hours into "standard" work days if required. Since table 16.2 represents the average holding, crops which comprise only minor mixtures in cropping patterns do not appear in the summary labour budget.

16.4 The table shows the labour requirement of each agricultural operation according to crop, which may be a pure stand or more commonly the dominant crop in a mixture. Agricultural operations cover: land clearance; cultivation; planting; first, second and third weeding; and harvesting. For some crops - notably, but not exclusively, trees - there may be additional operations such as pruning or thinning which do not easily fall within the standard classification. Two general categories of establishment and maintenance operations are therefore included. Such a classification provides good coverage for most activities and allows diverse crops to be handled in a standard manner.

16.5 In the interpretation of labour budgets it should be remembered that only tree cropping farmers will require labour on tree crops while non-tree cropping farmers will not require any. Labour budgets are also presented on the basis of labour input "when operations are performed". Adjustment is not made to the labour input to take account of operations which are omitted. By referring to annex 2 adjustments may be made to budgets based on different assumptions about management intensity. Incorporating this into the present analysis would considerably increase the complexity of presentation and introduce ambiguity into the results.

Table: 16.2
ANNUAL LABOUR INPUT BY HOLDING

	work days per year per holding				per ha	% contribution			labour cost
	men	women	paid	total	average	men	women	paid	(I)
i) Land Clearance									
Coconut	51	42	3	96	170	53	44	3	17
Cabbage					135				
Banana					56				
Nut trees	1	1		2	462	50	50		
Sweet Potato	18	35		53	1057	34	66		
Taro	4	8		12	562	33	67		
Yam	6	9		15	867	40	60		
Pana	10	11		21	525	48	52		
Total holding	90	106	3	199	628	45	53	2	17
ii) Cultivation									
Coconut									
Cabbage					81				
Banana					11				
Nut trees	1	1		2	462	50	50		
Sweet Potato	11	9		20	403	55	45		
Taro	2	6		8	401	25	75		
Yam	3	1		4	201	75	25		
Pana	6	3		9	216	67	33		
Total holding	23	20		43	341	53	47		
iii) Planting									
Coconut	54	48	1	103	180	52	47	1	2
Cabbage					81				
Banana					7				
Nut trees					88				
Sweet Potato	1	28		29	574	3	97		
Taro	2	7		9	436	22	78		
Yam		3		3	175		100		
Pana		7		7	177		100		
Total holding	57	93	1	151	310	38	62	1	2

ANNUAL LABOUR INPUT BY HOLDING (continued)

	⟨------ work days per year -----⟩ ⟨----- per holding -----⟩				per ha	⟨- % contribution -⟩			labour cost
	men	women	paid	total	average	men	women	paid	($IS)
iv) Establishment									
Coconut									
Cabbage									
Banana									
Nut trees									
Sweet Potato									
Taro									
Yam									
Pana									
Total holding									
v) Maintenance									
Coconut	22	6		28	49	79	21		
Cabbage									
Banana									
Nut trees									
Sweet Potato									
Taro									
Yam									
Pana									
Total holding	22	6		28	49	79	21		
vi) First Weeding									
Coconut	47	37		84	147	56	44		
Cabbage					108				
Banana									
Nut trees					88				
Sweet Potato	6	20		26	512	23	77		
Taro	1	2		3	161	33	67		
Yam	1	1		2	120	50	50		
Pana	2	4		6	131	33	67		
Total holding	57	64		121	258	47	53		

ANNUAL LABOUR INPUT BY HOLDING (continued)

	work days per year per holding men	women	paid	total	per ha average	% contribution men	women	paid	labour cost (SIS)
vii) Second Weeding									
Coconut									
Cabbage									
Banana									
Nut trees									
Sweet Potato	11	11		22	438	50	50		
Taro		1		1	38		100		
Yam									
Pana									
Total holding	11	12		23	194	48	52		
viii) Third Weeding									
Coconut									
Cabbage									
Banana									
Nut trees									
Sweet Potato									
Taro					24				
Yam									
Pana									
Total holding					24				
ix) Harvesting									
Coconut	30	14		44	77	68	32		
Cabbage									
Banana									
Nut trees									
Sweet Potato	33	111		144	2881	23	77		
Taro	6			6	306	100			
Yam		6		6	355		100		
Pana	2	27		29	742	7	93		
Total holding	71	158		229	458	31	69		

16.6 A high proportion of labour is expended on land preparation for and the planting of coconuts. Coconuts account for **48%** of the labour expended in land clearance, requiring **96** work days per year. Root crops account for a further **51%** of labour expended, requiring **101** days mainly on sweet potato. Of **199** work days, men contribute **45%**, women **53%** and paid labour accounts for **2%**.

16.7 Land cultivation is a much smaller task requiring only **43** days, mainly on root crops. Labour is shared fairly evenly where men contribute **53%** and women contribute **47%**.

16.8 **68%** of the labour expended in planting is on coconuts, accounting for **103** work days per year, with a further **48** work days, or **32%** of the labour budget on root crops. Of **151** work days per year required on planting men contribute **38%** while women contribute **62%**. Women perform most of the planting of root crops and share the planting of coconuts with men.

16.9 **28** days per year are expended on the maintenance of coconuts for which men contribute **79%** of labour and women contribute **21%**.

16.10 **121** work days are spent on the first weeding of crops, of which **69%** is accounted for on the brushing of coconuts and **31%** on the weeding of root crops. Men and women share most tasks and men contribute **47%** of the labour on first weeding compared with **53%** from women.

16.11 **23** work days are spent on the second weeding of crops, which is mainly on sweet potato. Men provide **48%** of the labour on second weeding and women provide **52%**.

16.12 Harvesting is a major operation requiring **229** work days. Only **19%** of harvesting time is on coconuts and the rest on root crops. Women perform about one third of the harvesting of coconuts, but overall women provide **69%** of harvesting lanbour.

16.13 Overall men provide **42%** of labour and women provide 58%, with 1% of farm labour accounted for by hired labour. Table 16.3 presents a summary of labour by crop and by operatior.

16.14 There are **794** work days per year required on an "average" holding of which **331** are provided by men, **459** by women and **4** by hired labour. The average adult man in the household spends **235** days working on the holding and the average adult woman spends **275** days.

Table: 16.3
SUMMARY OF LABOUR INPUT

	⟨------ work days per year -----⟩					⟨- % contribution -⟩			labour
	⟨----- per holding -----⟩				per ha				cost
i) By Crop	men	women	paid	total	average	men	women	paid	(I)
Coconut	204	147	4	355		57	41	1	19
Cabbage					405				
Banana					74				
Nut trees	2	2		4	1100	50	50		
Sweet Potato	80	214		294	5865	27	73		
Taro	15	24		39	1928	38	62		
Yam	10	20		30	1718	33	67		
Pana	20	52		72	1791	28	72		
All Crops	331	459	4	794		42	58	1	19
ii) By Operation									
Land Clearance	90	106	3	199		45	53	2	17
Cultivation	23	20		43		53	47		
Planting	57	93	1	151		38	62	1	2
Tree Crops Establishment									
Tree Crops Maintenance	22	6		28		79	21		
First Weeding	57	64		121		47	53		
Second Weeding	11	12		23		48	52		
Third Weeding									
Harvesting	71	158		229		31	69		
All Operations	331	459	4	794		42	58	1	19
Available labour units	:1.41	1.67							
Days per unit labour	: 235	275	4						

16.15 Labour by crop is illustrated in diagram 16.2. Coconut accounts for **45%** of the holding labour budget. Sweet potato accounts for **37%**, taro 5%, yam **4%** and pana **9%**.

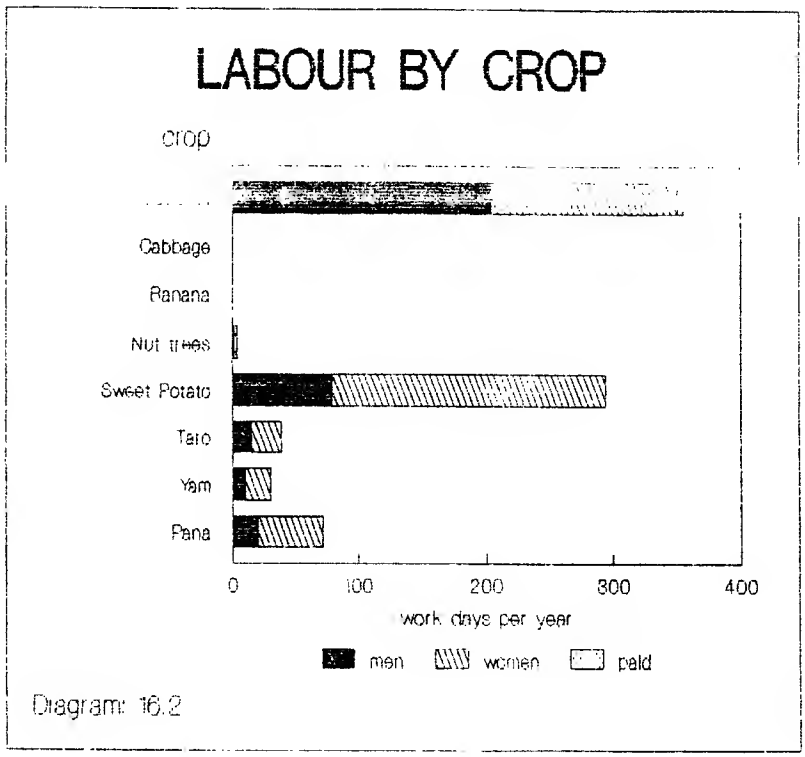


Diagram: 16.2

16.16 Labour by operation is illustrated in diagram 16.3. Men and women share most operations. Of the annual labour budget of **794** days, land clearance accounts for **25%** of labour expended, cultivation accounts for **5%**, planting **19%**, establishment and maintenance **4%**, weeding or brushing **18%** and harvesting 29%.

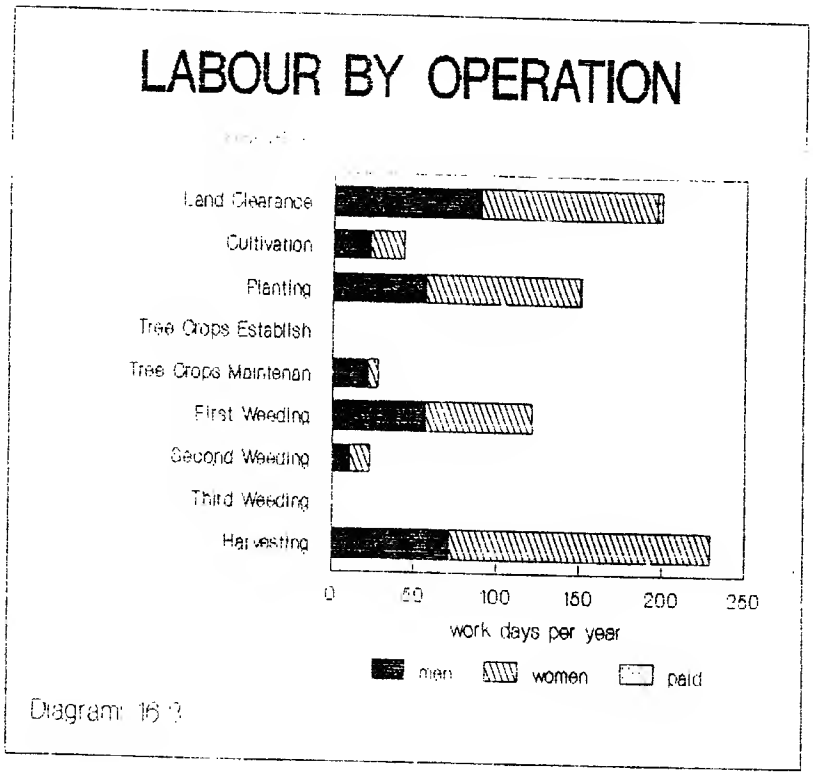


Diagram 16.3

16.17 Diagram 16.4 illustrates the contribution from men, women and hired labour. Men contribute **42%** of labour on farm, women provide **58%** and hired labour accounts for **1%**.

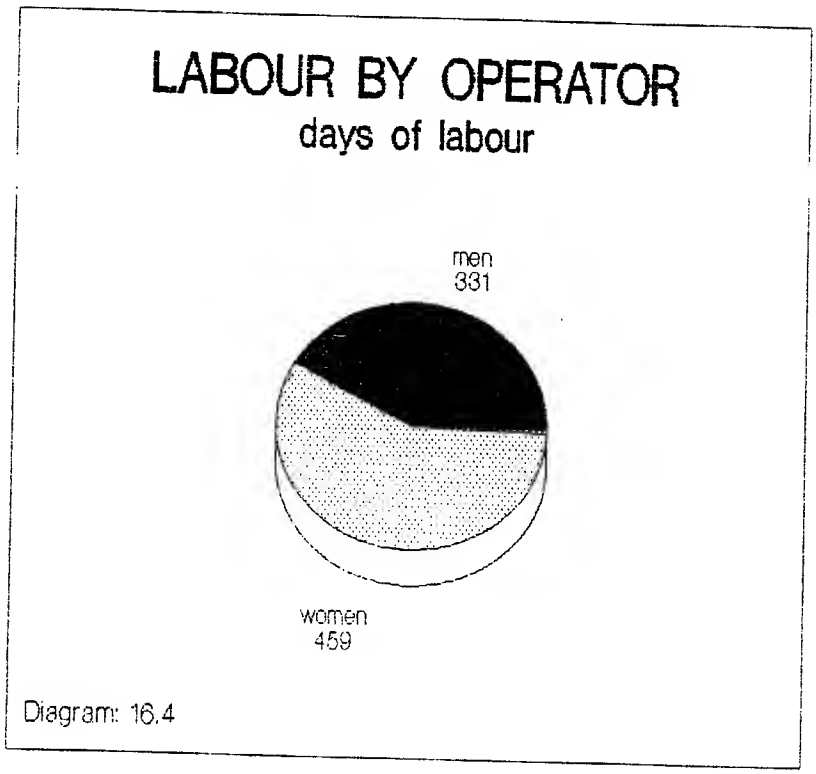


Diagram: 16.4

Chapter: 17
CROP AND FARM BUDGETS

17.1 It is not possible at this stage to produce comprehensive crop and farm budgets because of the complexity and diversity of cropping patterns, and production data are as yet incomplete. The main elements are available and a summary of information on cropping patterns, production and labour is presented in Table 17.1.

Table: 17.1
ELEMENTS OF A FARM BUDGET

main crop in mixture	area (ha)	annual production (kg)	annual labour	
			work days	cost ($IS)
a Cleared Land				
b Coconut	0.569	156	355	19
c Cocoa				
z Coconut and Cocoa				
d Pasture				
e Grain Crops				
f Beans				
g Cabbage	0.002	117		
h Vegetables		28		
i Spices				
j Fruit Crops		150		
k Fruit trees				
l Banana	0.008	101		
m Citrus trees				
n Nut trees	0.004	41	4	
o Sugar cane				
p Food/building tree		39		
q Tobacco		3		
r Sweet Potato	0.050	1,528	294	
s Taro	0.021	419	39	
t Yam	0.017	329	30	
u Pana	0.039	44	72	
v Cassava		15		
w Other root crop				
Total	0.710		794	19
Table reference	9.2	15.2	16.3	16.3

Chapter: 18
CASH CROP PROCESSING

18.1 Table 18.1 presents a labour budget for the production of copra based on 16 observations. The labour composition is **92%** family and **8%** hired at an annual cash cost of **SI$8.8**. Hired labour is employed mainly in collecting, splitting and transporting of nuts while all operations are performed by family labour.

18.2 Copra manufacture requires **126** work days per annum to produce **963kg** copra, or one work day per **8kg** copra produced. **59** work days are spent on picking and shelling the nuts which account for **47%** of the total production time. Firewood collection takes **43** days or **34%** of the time; and drying, bagging and transport take **24** days or **19%** of the time. The annual labour input is illustrated in diagram 18.1.

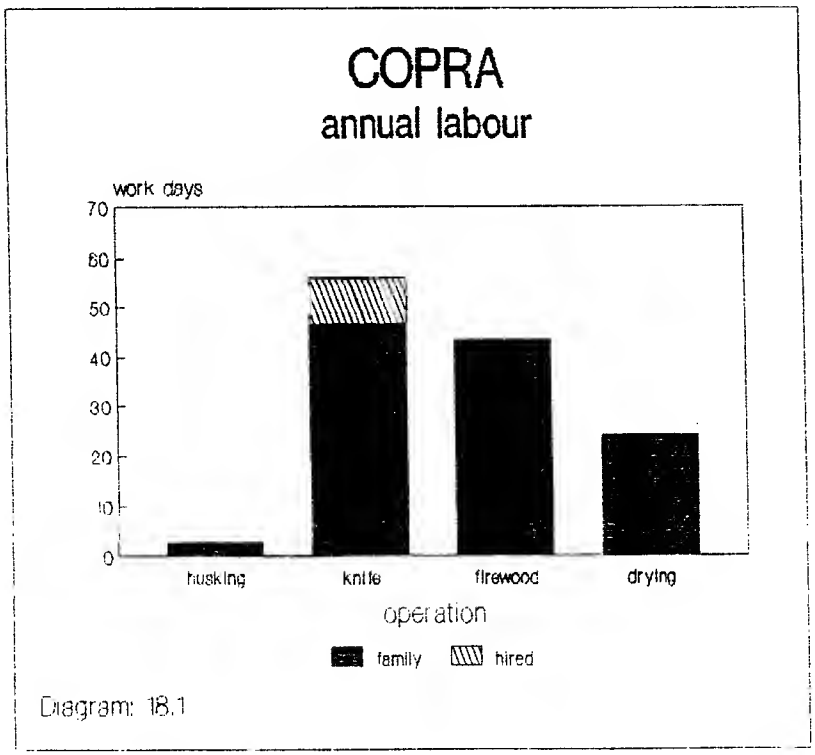


Diagram: 18.1

Table: 18.1
ANNUAL COPRA PRODUCTION AND LABOUR EXPENDITURE

Annual Labour Expenditure		family or shared labour		hired labour		total	% labour by operation
		work hours	work days	work days	cash cost ($.c)	work days	
HUSKING	picking, heaping	0.8	0.2			0.2	0
	husking	7.5	0.6			0.6	0
	transport	2.5	0.6			0.6	0
	breaking	3.8	0.3			0.3	0
	shelling	3.8	0.9			0.9	1
	total	18.3	2.7			2.7	2
COPRA KNIFE	picking, heaping	163.4	25.6	1.0	1.75	26.6	21
	axing + copra knife	77.9	11.7	6.1	3.63	17.3	14
	transport	49.6	9.3	2.4	2.19	11.7	9
	total	290.9	46.6	9.5	7.6	56.1	44
FIREWOOD	collection	116.1	18.6	0.5	1.25	19.1	15
	transport	79.5	12.9			12.9	10
	collection + transport	68.8	11.3			11.3	9
	total	264.4	42.8	0.5	1.3	43.3	34
DRYING	drying	202.0	16.2			16.2	13
	bagging	24.4	4.9			4.9	4
	transport	5.3	2.9			2.9	2
	total	231.8	24.0			24.0	19
TOTAL		805.3	116.0	10.0	8.8	126.0	100
% labour by type of labour			92	8		100	

copra grade	quantity of copra produced (kg)	
	per annum	per work day
Grade 1	925	7
Grade 2	38	0
Grade 3		
Ungraded		
total	963	8

Number of observations = 16

18.3 The gross margin for copra production is summarised in table 18.2. From an annual production of **963kg** valued at the prevailing price of 33 cents per kilo the gross return is **SI$318.** Inputs costs from bags and twine amount to **SI$14.28** and labour costs are **SI$8.80.** The net income is **SI$295** which, at a requirement of **116** household labour days, represents a net return to labour of **SI$2.54** per household work day.

Table: 18.2
COPRA GROSS MARGIN

Annual production (kg)	963
Price per kilogram (SI$)	0.33
Gross return (SI$)	318
Inputs cost (SI$)	14.26
Labour cost (SI$)	8.80
Net return (SI$)	295
Household labour days	116
Copra production per household work day (kg)	8.3
Net return per household work day (SI$)	2.54

Inputs costs: Sacks @ SI$1.00 per new sack;
Average packed weight 70kg = 14 sacks = SI$14.00.
Twine @ SI$1.00 per hank of 50 strings = SI$0.28.

18.4 No cocoa production was undertaken by sampled farmers.

Chapter: 19
MARKETING

19.1 Table 19.1 presents a summary of marketing data collected in the survey, listing crops marketed against the number of observation recorded. The mean weight marketed is recorded, the time taken to go to market and back, the number of times the commodity is marketed per year, and the number of people involved in marketing. These are grouped under the heading of "marketing" details.

19.2 Marketing costs are recorded under the headings of freight or transport costs, fares for people involved in marketing, and market tax which may be imposed at the point of sale.

19.3 Revenues are possible where wages are earned, for instance from selling other farmers' produce and from the sale of crops. It is often difficult for sellers to specify costs and revenues, and in such cases data have to be treated as "missing". Thus the number of observations for crop sales may be lower than those for marketing data.

19.4 Table 19.2 is a transformation of the raw marketing data into an "average" annual marketing budget. The data are incomplete because of difficulties in recalling weights sold and marketing revenues. It is presented not as a model marketing budget, but as a data set to provide as much information on marketing as possible, albeit with gaps.

19.5 The two right-most columns show the net marketing revenue by crop and by household. The "net marketing revenue by crop" is the net return from sales after deducting costs. It is not the average income from crop sales since revenue may be negative where income data are missing or as a result of the double counting of transport costs when freight expenses are shared among several crops.

19.6 The "net marketing revenue per household" is the average household earnings taking account of the proportion of households selling each type of crop, but based on the limitations of the crop revenue data.

Table: 19.1
MARKETING TIME AND CROP PRICES

Basic Marketing Data:

		marketing				costs			revenues		
		number of obs	mean weight marketed	time to market and back	times marketed per year	number of people	freight/ transport cost	fares for people	market tax	wages earned	crop sale price	crop sale obs
		(obs)	(kg)	(days)	(times)	(people)	(I)	(I)	(I)	(I)	($/kg)	(obs)
ALL CROPS	Average	87	97	1.0	16	1	2.27	1.12		0.03	0.35	89
COCONUT	Coconut	5	8	1.0	12	1	0.24	0.56		0.10	0.50	5
	Copra	16	427	1.0	2	1	11.06	4.31			0.38	16
ROOT CROPS	Sweet Potato	21	35	1.0	15	1	0.29	0.33		0.05	0.18	21
	Taro Common	4	38	1.0	9	1	0.38	0.60			0.15	4
	Hong Kong	3	33	1.0	2	1					0.16	3
	Yam	5	30	1.0	3	2	0.50	0.35			0.19	6
	Pana	8	41	1.0	17	1	0.46	0.57		0.03	0.18	9
GRAIN CROPS	Peanuts	1	2	1.0	6	1	0.60	1.20			0.50	1
CABBAGE	Hibiscus Cabbage	8	7	1.0	25	1	0.26	0.34			1.08	8
VEGETABLES	Tomato	1	2	1.0	12	1	0.50	0.50			0.40	1
	Green Pepper	1	2	1.0	12	1	0.50	0.50			0.33	1
BANANA	Cooking Banana	2	8	1.0	8	2	0.60	0.80			0.65	2
	Sweet Banana	1	5	1.0	99	3		0.60			1.00	1
NUT TREES	Betel Nut	8	6	1.0	29	1	0.35	0.43		0.10	0.40	8
SUGAR CANE	Sugar Cane	3	5	1.0	27	2	0.33	0.20			0.28	3
Number of households		39										

Table: 19.2
INCOME FROM MARKETING

Annual Marketing Budget:

		% households marketing crop (%)	weight marketed (kg)	man days (days)	costs (I) freight/ transport cost	fares for people	market tax	total marketing costs	revenues (I) wages earned	crop sales	total revenue	net marketing revenue by crop (I)	ne marketi revenu pe household (I
ALL CROPS	Average		1565	21.5	37	18		54.49	1	542.63	543.15	489	27
COCONUT	Coconut	13	335	57.4	14	23		36.90	7	66.13	72.74	36	
	Copra	41	960	2.7	25	10		34.58		361.81	361.81	327	1
ROOT CROPS	Sweet Potato	54	528	20.4	4	5		9.46	1	95.25	95.98	87	4
	Taro Common	10	328	10.9	3	5		8.53		49.22	49.22	41	
	Hong Kong	8	56	2.2						8.89	8.89	9	
	Yam	13	100	5.0	2	1		2.83		18.67	18.67	16	
	Pana	21	685	24.4	8	10		17.27	1	121.24	121.80	105	
GRAIN CROPS	Peanuts	3	12	6.0	4	7		10.80		6.00	6.00	-5	
CABBAGE	Hibiscus Cabbage	21	178	34.2	7	8		14.93		192.92	192.92	178	
VEGETABLES	Tomato	3	24	12.0	6	6		12.00		9.60	9.60	-2	
	Green Pepper	3	22	12.0	6	6		12.00		7.20	7.20	-5	
BANANA	Cooking Banana	5	60	11.3	5	6		10.50		39.00	39.00	29	
	Sweet Banana	3	495	297.0		59		59.40		495.00	495.00	436	
NUT TREES	Betel Nut	21	162	32.8	10	12		22.57	3	64.30	67.72	45	
SUGAR CANE	Sugar Cane	8	123	45.6	9	5		14.58		34.99	34.99	20	

19.7 Table 19.3 shows the time taken to different markets and the type of crop sold at each market. The classification of markets is subject to local interpretation, where "central" would generally be the provincial capital.

Table: 19.3
MARKET LOCATION

market location:		local	inter-mediate	central	Honiara	trading ship	% obs	number of obs
i) Time taken to market produce								
time taken to go to market and back (days)				(% observations)				
0 - .5								
.5 - 1		11		88			99	89
1 - 2								
2 - 5								
5 - 10								
> 10					1		1	1
% observations		11		88	1		100	
number of observations		10		79	1		90	90
mean time (days)		1		1	28			1.75
ii) Crops sold at different markets				(% observations)				
COCONUT	Green Nuts			6			6	6
	Copra			18			18	16
ROOT CROPS	Sweet Potato	3		20			23	21
	Taro Common	1		3			4	4
	Hong Kong	3					3	3
	Yam	1		6			7	6
	Pana	1		9			10	9
GARIN CROPS	Reanuts			1			1	1
CABBAGE	Hibiscus			9			9	8
VEGETABLE	Tomato			1			1	1
	Green Pepper			1			1	1
BANANA	Cooking Banana			2			2	2
	Sweet Banana			1			1	1
NUT TREES	Betel Nut	1		8	1		10	9
SUGAR CANE	Sugar Cane			3			3	3
% observations		11		88	1		100	
number of observations		10		79	1			90

19.8 Table 19.4 summarises crop price perception and sale volumes.

Table: 19.4
CROP PRICE PERCEPTION AND SALE VOLUMES

		(---- sale price ----)			(----- sale volume -----)			number of obs
		poor	average	good	little	average	more than usual	
COCONUT	Green Nuts	20	40	40	60	40		5
	Copra	38	56	6	63	38		16
ROOT CROPS	Sweet Potato	19	62	19	67	33		21
	Taro Common	25	50	25	50	50		4
	Hong Kong	67	33		100			3
	Yam	17	67	17	33	67		6
	Pana	11	67	22	44	56		9
GRAIN CROPS	Peanuts		100			100		1
CABBAGE	Hibiscus Cabbage	13	50	38	50	50		8
VEGETABLES	Tomato	100				100		1
	Green Pepper	100				100		1
BANANA	Cooking Banana		50	50		100		2
	Sweet Banana		100		100			1
NUT CROPS	Betel Nut	11	44	44	44	56		9
SUGAR CANE	Sugar Cane		33	67	33	67		3
Number of observations		20	49	21	48	42		90

19.9 Sale volumes and prices are generally low to average. Local market prices from Lata are listed below:

ocal Market Prices in Lata on 25 May 1988

Commodity	price (SI$/kg)	
Coconut - Green	.33	
- Dry	.08	
Sweet Potato	.29	.31
Pana	.25	.32
Yam	.20	.23
Taro - Hong Kong	.29	
Banana - Cooking	.25	
- Sweet	.17	
Pineapple	.19	
Sugar Cane	.11	
Cabbage - Hibiscus	.15	
Long Bean	1.00	
Wing Bean	0.40	
Cucumber	0.15	
Pumpkin	0.20	
Betel Nut	.50	
Ngali Nut	.50	
Peanut	4.00	

19.10 Table 19.5 summarises marketing problems. To the right of the table are the proportion of cases by severity of problem. These are combined with crop type in the body of the table to show the "index of severity". In this index "no problem" is weighted "0", "slight problem" is weighted "0.5", and "severe problem" is weighted "1.0". Thus if all cases registered a severe problem the index would be "1.0".

Table: 19.5
MARKETING PROBLEMS

Number of observations = 90

	⟨--- crop type ---⟩			⟨--- severity of problem ---⟩		
	coconut and cocoa	root crops	other crops	none	slight	severe
	(index of severity)			(% cases)		
terrain too difficult	0.0	0.1	0.0	73	27	
distance too great	0.1	0.2	0.1	44	37	19
not enough time/labour	0.0	0.1	0.0	70	29	1
transport cost too high	0.2	0.2	0.1	34	33	32
low price at market	0.1	0.2	0.1	26	50	24
lack of transport	0.1	0.1	0.0	72	22	6
unreliable transport	0.1	0.0	0.0	79	16	6
risk of not selling enough	0.0	0.2	0.1	33	67	
crop damage in transit	0.0	0.1	0.0	71	29	
administrative restrictions				100		
quarantine control				100		
other problem	0.0	0.0	0.0	96		4

Note: "Index of Severity is a weighted summary of severity of marketing problems.
It falls in the range 0 to 1 where 0.0 = no marketing problem
0.5 = slight marketing problem
1.0 = severe marketing problem

19.11 Marketing problems mostly slight, but terrain and distance, labour shortage, low prices, lack of transport and risk of not selling enough are all problems.

Annex: 1
CROP NAMES AND CODES

A1.1 The following list describes the hierarchical coding sequence used by AES in farming systems surveys to describe crop types. The list may be added to by inserting other crops of interest within the appropriate category.

A1.2 At the garden level only broad distinctions are made between cleared land, tree crops, short term cash crops, and food crops. Only single digit numeric codes are permitted at this level and these do not distinguish between crop type or mixtures. They do, however, provide important information about the structure of the holding. Code "1" for instance specifies "tree crops".

A1.3 At the plot level alphabetical codes are used to describe crop mixtures. These are used to describe cropping patterns and the analysis of labour by crop. Letter codes are strung together so there is no pre-set limit on the complexity of mixtures described. Some simplification is introduced within the code categories themselves. The dominant crop is listed first and other crops are listed to the right in decreasing order of importance. The string code then takes the form of an alphabetical "number", where the most significant characters are to the left and the least significant to the right. Forinstance "a" specifies "cleared land", while "rvgfl" specifies a mixture in decreasing order of importance of "sweet potato, cassava, cabbage, beans, banana".

A1.4 At the yield and marketing levels it is necessary to specify exactly the crop under study, and so a unique three-digit numeric code is assigned to each crop. The list need not be complete and may be added to as necessary since "spare codes" are available. Forinstance "613" specifies "pineapple".

Table: A1.1
CROP NAMES AND CODES

garden		plot	yield and marketing		scientific name
code	name	code	code	name	
0	cleared	a	100	CLEARED (unplanted)	
1	tree crops	b	200	COCONUT	Cocos nucifera
			210	Local Tall	
			211	Rennel	
			212	Dwarf Hybrid	
			219	Other	
			250	Copra	
1	tree crops	c	300	COCOA	Theobroma cacao
			310	Cocoa green beans	
			311	Cocoa dry beans	
		d		Pasture	
3	food crops		400	ROOT CROPS	
		r	410	Sweet Potato	Ipomoea batatas
		s	411	Taro Common	Colocasia esculenta
		s	412	Giant	Alocasia micorhiza
		s	413	Hong Kong	Xanthosoma saggitifolium
		s	414	Swamp	Cytosperma chamissonis
		t	415	Yam	Dioscorea alata
		u	416	Pana	Dioscorea esculenta
		v	417	Cassava	Manihot esculenta
		w	419	Other root crop	
3	food crops	e	430	GRAIN CROPS	
			431	Corn	Zea mays
			432	Peanuts	Arachis hypogaea
			439	Other grain crop	
3	food crops	f	440	BEANS	
			441	Long bean	Phaseolus vulgaris
			442	Wing bean	Psophocarpus tetragonolobus
			443	Snake bean	Trichosanthes cucumerina
			444	Mung bean	Phaseolus aureus
			445	Pigeon pea	Cajanus cajan
			449	Other bean	

3	food crops	g	450	CABBAGE	
			451	Hibiscus cabbage	Hibiscus manihot
			452	Kangkong	
			453	Chinese cabbage	Brassica chinensis
			454	English cabbage	Brassica compestis
			455	Watercress	
			459	Other cabbage	
3	food crops	h	460	VEGETABLE	
			461	Pumpkin	Cucurbita maxima
			462	Cucumber	Cucumis sativus
			463	Shallot	Allium spp.
			464	Onion	Allium cepa
			465	Tomato	Lycopersicon esculentum
			466	Okra	Hibiscus esculentus
			467	Egg plant	Solanum melongena
			468	Green pepper (sweet)	Capsicum annuum
			479	Other vegetable	
2	short term cash crops	i	500	SPICES	
			511	Chilli pepper	Capsicum spp.
			512	Pepper corn	Piper nigrum
			513	Turmeric	Curcuma domestica
			514	Cardamom	Ellettaria cardamomum
			515	Cinnamon	Cinnamomum zeylanicum
			516	Ginger	Zingiber officinale
			517	Garlic	Allium sativum
			518	Vanilla	Vanilla fragrans
			529	Other spice	
2/3	cash/food crops	j	600	FRUIT CROPS	
			611	Water melon	Citrullus lanatus
			612	Rock melon	
			613	Pineapple	Ananas comosus
			614	Paw Paw	Carica papaya
			615	Passion fruit	Passiflora edulus f. flavicarpa
			619	Other fruit crop	
1	tree crops	k	620	FRUIT TREES	
			621	Guava	Psidium guajava
			622	Mango	Mangifera indica
			623	Soursop	
			624	Local Apple	
			625	Malayan Apple	Eugenia malaccensis
			626	Avocado	Persea americana
			629	Other fruit tree	

3	food crops	l	630	BANANA	Musa spp.
			631	Cooking banana	
			632	Sweet banana	
			639	Other banana	
1	tree crops	m	640	CITRUS TREES	
			641	Orange	Citrus sinensis
			642	Lime	Citrus aurantifolia
			643	Grapefruit	Citrus paradisi
			644	Pomelo	Citrus grandis
			649	Other citrus	
1	tree crops	n	650	NUT TREES	
			651	Ngali Nut	Canarium spp.
			652	Cut Nut	Barringtonia spp.
			653	Betel Nut	Areca catechu
			654	Cashew Nut	Anacardium occidentale
			655	Alite Nut	Terminalia catappa
			659	Other Nut	
2	short term cash crops	o	660	SUGAR CANE	
			661	Sugar cane	Saccharum spp.
			662	Pit Pit	Saccharum edule
			669	Other	
1	tree crops	p	700	FOOD/BUILDING TREE	
			701	Breadfruit	Artocarpus altilis
			702	Sago palm	Metroxylon spp.
			703	Bamboo	Nastus spp.
			709	Other tree	
2	short term cash crops	q	800	Tobacco	Nicotiana tabacum

Annex: 2
LABOUR BUDGETS

A2.1 Sunmmaries of labour in the main body of the report are derived from labour budgets shown in tables A2.1 to A2.9, each covering a major land or crop operation:

Table	Operation
A2.1	Land Clearance
A2.2	Cultivation
A2.3	Planting
A2.4	Tree Crops Establishment
A2.5	Tree Crops Maintenance
A2.6	First Weeding
A2.7	Second Weeding
A2.8	Third Weeding
A2.9	Harvesting

A2.2 Each table is divided into twc sub-tables, named "a" and "b". Part "a" expresses budgets in the form of labour per hectare. Part "b" converts these results to labour per holding, based on mean holding sizes previously derived.

A2.3 Tables in "part a" are divided into two main components. Part "i" expresses "labour input by main crop growing in the plot". This is the measured labour input from field data and is derived from a subsample of plot observations. To the left of the table is the main crop type, which is the dominant crop in a mixture. In the first column of the table is the number of plots on which observations were made, and in the second column is the mean area of observed plots. The third column summarises the average number of times per year that the operation is performed in a cropping sequence, and the fourth column expresses the average number of hours worked per day.

A2.4 Within the box are labour data expressed in terms of seasonal (single crop) and annual (crop sequence) labour input, broken down by men, women and paid labour. The wage cost of paid labour is shown in the right-most column. In this, hours are converted to days by dividing by the average number of hours worked per day. This then takes account of "unproductive" time such as for travel to and from the garden, and expresses labour in terms of actual time taken. It does not, however, take account of different agricultural operations which may take place on the same day for instance where a morning might be spent clearing a plot while the afternoon is spent in weeding. Commonly work is split between the cool hours of the morning and late afternoon and so such circumstances should not generally arise.

A2.5 Below is "part ii" of the table, in which the composition of labour input is shown in more detail. The first four columns show the average number of workers in each category. Within the box is a summary of the table above, in which the % contribution of men, women and paid labour is shown.

A2.6 "Part b" of the table is on the page following "part a", in which annual labour per hectare is converted to annual labour per holding based on mean holding areas recorded for each given crop and operation - since each sub-sample will differ from the others. These are shown in the upper part of the table in two forms, as work hours and as work days by category of labour. The annual wage labour cost is shown in the far right column of the table.

A2.7 Below is the labour budget expressed in terms of time per household labour unit. In this it is assumed that communal labour is reciprocated and so balances out. Total labour input may therefore be expressed simply in terms of family labour. Wage labour is external and is therefore given the adult equivalent "weighting" of 1. Family labour is weighted according to the age composition of the family, analysed in chapter 3.

A2.8 Each set of tables for an operation is accompanied by a diagram in which the annual days of labour per holding are summarised by crop and by labour category.

A2.9 Various points should be noted about the derivation of labour budgets:

i) They are expressed in the form of "models" which are based on a sub-sample of observations. These are derived from interview, not direct measurement, although care is taken to minimise recall periods. Labour budgets are built up from a mosaic of labour records.

ii) Crop categories are summaries of complex mixtures in which the crop listed is dominant. Labour data are thus compatible with cropping pattern data and represents actual field conditions. No attempt is made to restrict or control the conditions under observation.

iii) Each table shows the labour input for an operation which is conducted. The tables do not show the extent to which operations may be missed or combined. Such refinements are difficult to include without a more complex, and therefore more costly and time consuming, survey design. The analysis therefore tends to be conservative since it does not take account of possible economies in combined operations.

iv) Caution should be exercised in interpreting results from few observations since labour data on complex systems are very variable.

v) Labour, although of central importance in the agricultural economy, is not necessarily economically optimising. Often labour has an important social character in which households will group together and "share" labour. Differences in site and labour composition, together with the social character of some labour, introduce considerable variability into results.

Table: A2.1
LABOUR OPERATIONS ON LAND CLEARANCE (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: men (hours/ha)	labour input: per season: women (hours/ha)	labour input: per season: paid (hours/ha)	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	101	0.250	1.65	6.1	974	1334	9	3831	628	6.85
Coconut	b:	23	0.897	1.00	6.7	605	493	37	1135	170	30.03
Cabbage	g:	1	0.074	1.00	7.0	473	473		946	135	
Banana	l:	1	0.286	1.00	8.0	224	224		448	56	
Nut trees	n:	1	0.137	1.00	8.0	1231	2462		3693	462	
Sweet potato	r:	29	0.046	3.07	5.8	687	1308		6123	1057	
Taro	s:	10	0.075	1.30	5.8	809	1699		3260	562	
Yam	t:	9	0.067	1.33	7.1	1956	2670		6168	867	
Pana	u:	27	0.053	1.00	5.5	1367	1529		2896	525	

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	1.2	1.4	0.0	2.7	42	58	0
Coconut	b:	2.0	1.5	0.2	3.7	53	43	3
Cabbage	g:	1.0	1.0		2.0	50	50	
Banana	l:	2.0	2.0		4.0	50	50	
Nut trees	n:	1.0	2.0		3.0	33	67	
Sweet potato	r:	0.9	1.4		2.3	34	66	
Taro	s:	0.8	1.0		1.8	32	68	
Yam	t:	1.0	1.7		2.7	42	58	
Pana	u:	1.0	1.4		2.4	47	53	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON LAND CLEARANCE (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SI$)
Total :	0.710	577	660	21	90	105	3	199	17
Coconut :	0.569	344	281	21	51	42	3	96	17
Cabbage :	0.002	1	1		0	0		0	
Banana :	0.008	2	2		0	0		0	
Nut trees :	0.004	5	10		1	1		2	
Sweet potato :	0.050	105	201		18	35		53	
Taro :	0.021	22	46		4	8		12	
Yam :	0.017	44	61		6	9		15	
Pana :	0.039	53	60		10	11		20	
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.41	1.67	1.00					
Total	409	395	21	64	63	2	47	53
Coconut	244	168	21	36	25	2	55	45
Cabbage	1	1		0	0		50	50
Banana	1	1		0	0		50	50
Nut trees	3	6		0	1		33	67
Sweet potato	75	120		13	21		34	66
Taro	16	28		3	5		32	68
Yam	31	36		4	5		42	58
Pana	38	36		7	6		47	53

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.2
LABOUR OPERATIONS ON CULTIVATION (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	79	0.088	1.82	6.0	611	504		2032	341	
Coconut	b:	1	2.400								
Cabbage	g:	1	0.074	1.00	7.0	284	284		568	81	
Banana	l:	1	0.286	1.00	8.0	56	28		84	11	
Nut trees	n:	1	0.137	1.00	8.0	1231	2462		3693	462	
Sweet potato	r:	19	0.045	3.07	5.8	423	342		2348	403	
Taro	s:	10	0.075	1.30	6.2	492	1430		[illegible]	[illegible]	
Yam	t:	9	0.067	1.33	7.6	921	219		1520	201	
Pana	u:	27	0.053	1.00	5.5	786	407		1193	216	

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	1.9	0.9		2.8	55	45	
Coconut	b:							
Cabbage	g:	1.0	1.0		2.0	50	50	
Banana	l:	2.0	1.0		3.0	67	33	
Nut trees	n:	1.0	2.0		3.0	33	67	
Sweet potato	r:	1.1	0.5		1.7	55	45	
Taro	s:	0.7	1.0		1.7	26	74	
Yam	t:	3.3	0.7		4.0	81	19	
Pana	u:	2.9	1.4		4.3	66	34	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON CULTIVATION (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (I)
Total :	0.719	136	123		22	20		43	
Coconut :	0.569								
Cabbage :	0.002	1	1		0	0		0	
Banana :	0.008	0	0		0	0		0	
Nut trees :	0.004	5	10		1	1		2	
Sweet potato :	0.050	65	52		11	9		20	
Taro :	0.021	13	39		2	6		8	
Yam :	0.017	21	5		3	1		3	
Pana :	0.039	31	16		5	3		8	
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.41	1.67	1.00					
Total	96	73		16	12		53	47
Coconut								
Cabbage	0	0		0	0		50	50
Banana	0	0		0	0		67	33
Nut trees	3	6		0	1		33	67
Sweet potato	46	31		8	5		55	45
Taro	10	23		2	4		26	74
Yam	15	3		2	0		81	19
Pana	22	10		4	2		66	34

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.3
LABOUR OPERATIONS ON PLANTING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	101	0.250	1.67	6.1	208	917	1	1885	310	0.92
Coconut	b:	23	0.897	1.00	6.5	610	551	6	1167	180	4.03
Cabbage	g:	1	0.074	1.00	7.0	284	284		568	81	
Banana	l:	1	0.286	1.00	8.0	28	28		56	7	
Nut trees	n:	1	0.137	1.00	8.0	352	352		704	88	
Sweet potato	r:	29	0.046	3.07	5.8	23	1054		3305	574	
Taro	s:	11	0.072	1.45	6.3	505	1374		2733	436	
Yam	t:	9	0.067	1.33	7.1	17	914		1241	175	
Pana	u:	26	0.052	1.00	5.5		976		976	177	

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	0.5	2.4	0.1	3.0	18	81	0
Coconut	b:	1.7	1.1	0.3	3.1	52	47	0
Cabbage	g:	1.0	1.0		2.0	50	50	
Banana	l:	1.0	1.0		2.0	50	50	
Nut trees	n:	1.0	1.0		2.0	50	50	
Sweet potato	r:	0.1	1.7		1.8	2	98	
Taro	s:	0.7	0.9		1.6	27	73	
Yam	t:	0.1	5.6		5.7	2	98	
Pana	u:		3.9		3.9		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON PLANTING (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SIS)
Total :	0.710	369	578	3	57	93	1	151	2
Coconut :	0.569	347	314	3	54	48	1	102	2
Cabbage :	0.002	1	1		0	0		0	
Banana :	0.008	0	0		0	0		0	
Nut trees :	0.004	1	1		0	0		0	
Sweet potato :	0.050	4	162		1	28		29	
Taro :	0.021	15	42		2	7		9	
Yam :	0.017	0	21		0	3		3	
Pana :	0.039		38			7		7	
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.41	1.67	1.00					
Total	261	346	3	40	56	0	39	61
Coconut	246	188	3	38	29	0	53	47
Cabbage	0	0		0	0		50	50
Banana	0	0		0	0		50	50
Nut trees	1	1		0	0		50	50
Sweet potato	3	97		0	17		2	98
Taro	11	25		2	4		27	73
Yam	0	12		0	2		2	98
Pana		23			4			100

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.4
LABOUR OPERATIONS ON ESTABLISHMENT (per hectare)

i) Labour input by main crop growing in the plot

	number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season men	labour input: per season women	labour input: per year hours paid (hrs/ha)	labour input: per year days (d/ha)	labour cost ($/ha/yr)
All plots summary :									
Coconut b:									
Cabbage g:									
Banana l:									
Nut trees n:									
Sweet potato r:									
Taro s:									
Yam t:									
Pana u:									

ii) Labour composition

	average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary :							
Coconut b:							
Cabbage g:							
Banana l:							
Nut trees n:							
Sweet potato r:							
Taro s:							
Yam t:							
Pana u:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON ESTABLISHMENT (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SIS)
Total	0.710								
Coconut	0.569								
Cabbage	0.002								
Banana	0.008								
Nut trees	0.004								
Sweet potato	0.050								
Taro	0.021								
Yam	0.017								
Pana	0.039								
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.41	1.67	1.00					
Total								
Coconut								
Cabbage								
Banana								
Nut trees								
Sweet potato								
Taro								
Yam								
Pana								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.5
LABOUR OPERATIONS ON MAINTENANCE (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	18	0.876	2.33	6.7	109	32		329	49	
Coconut	b:	18	0.876	2.33	6.7	109	32		329	49	
Cabbage	g:										
Banana	l:										
Nut trees	n:										
Sweet potato	r:										
Taro	s:										
Yam	t:										
Pana	u:										

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	1.7	0.6		2.3	77	23	
Coconut	b:	1.7	0.6		2.3	77	23	
Cabbage	g:							
Banana	l:							
Nut trees	n:							
Sweet potato	r:							
Taro	s:							
Yam	t:							
Pana	u:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON MAINTENANCE (per holding)

i) Total time worked

	mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SI$)
Total	0.710	145	42		22	6		28	
Coconut	0.569	145	42		22	6		28	
Cabbage	0.002								
Banana	0.008								
Nut trees	0.004								
Sweet potato	0.050								
Taro	0.021								
Yam	0.017								
Pana	0.039								
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.41	1.67	1.00					
Total	103	25		15	4		77	23
Coconut	103	25		15	4		77	23
Cabbage								
Banana								
Nut trees								
Sweet potato								
Taro								
Yam								
Pana								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.6
LABOUR OPERATIONS ON FIRST WEEDING (per hectare)

i) Labour input by main crop growing in the plot

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per year: hours paid (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
All plots summary	:	77	0.111	2.03	5.6	220	497	1453	258	
Coconut	b:	5	0.971	2.00	6.2	256	201	914	147	
Cabbage	g:	1	0.074	2.00	7.0	189	189	756	108	
Banana	l:									
Nut trees	n:	1	0.137	1.00	8.0	352	352	704	88	
Sweet potato	r:	30	0.046	3.13	5.5	202	692	2801	512	
Taro	s:	10	0.046	1.50	6.0	267	378	968	161	
Yam	t:	8	0.061	1.38	6.1	271	264	736	120	
Pana	u:	22	0.053	1.05	5.2	192	456	677	131	

ii) Labour composition

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
All plots summary	:	0.7	1.3		2.0	31	69	
Coconut	b:	2.8	2.0		4.8	56	44	
Cabbage	g:	1.0	1.0		2.0	50	50	
Banana	l:							
Nut trees	n:	1.0	1.0		2.0	50	50	
Sweet potato	r:	0.6	1.4		1.9	23	77	
Taro	s:	0.7	0.8		1.5	41	59	
Yam	t:	0.8	1.4		2.1	51	49	
Pana	u:	0.5	1.2		1.7	30	70	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON FIRST WEEDING (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SI$)
Total :	0.710	348	376		57	64		121	
Coconut :	0.569	291	229		47	37		84	
Cabbage :	0.002	1	1		0	0		0	
Banana :	0.008								
Nut trees :	0.004	1	1		0	0		0	
Sweet potato :	0.050	32	108		6	20		26	
Taro :	0.021	8	12		1	2		3	
Yam :	0.017	6	6		1	1		2	
Pana :	0.039	8	19		2	4		5	
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.41	1.67	1.00					
Total	247	225		40	38		48	52
Coconut	207	137		33	22		56	44
Cabbage	1	0		0	0		50	50
Banana								
Nut trees	1	1		0	0		50	50
Sweet potato	22	65		4	12		23	77
Taro	6	7		1	1		41	59
Yam	4	4		1	1		51	49
Pana	6	11		1	2		30	70

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.7
LABOUR OPERATIONS ON SECOND WEEDING (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per year: hours paid (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot										
All plots summary	:	2	0.020	2.00	5.5	219	314	1066	194	
Coconut	b:									
Cabbage	g:									
Banana	l:									
Nut trees	n:									
Sweet potato	r:	1	0.014	3.00	6.0	438	438	2628	438	
Taro	s:	1	0.026	1.00	5.0		190	190	38	
Yam	t:									
Pana	u:									

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	0.5	1.0		1.5	41	59	
Coconut	b:							
Cabbage	g:							
Banana	l:							
Nut trees	n:							
Sweet potato	r:					50	50	
Taro	s:	1.0	1.0		2.0		100	
Yam	t:		1.0		1.0			
Pana	u:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON SECOND WEEDING (per holding)

i) Total time worked

		mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SIS)
Total	:	0.710	66	70		11	12		23	
Coconut	:	0.569								
Cabbage	:	0.002								
Banana	:	0.008								
Nut trees	:	0.004								
Sweet potato	:	0.050	66	66		11	11		22	
Taro	:	0.021		4			1		1	
Yam	:	0.017								
Pana	:	0.039								
Other		0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.41	1.67	1.00					
Total	47	42		3	7		49	51
Coconut								
Cabbage								
Banana								
Nut trees								
Sweet potato	47	39		8	7		50	50
Taro		2			0			100
Yam								
Pana								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.8
LABOUR OPERATIONS ON THIRD WEEDING (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	1	0.026	1.00	5.0	119			119	24	
Coconut	b:										
Cabbage	g:										
Banana	l:										
Nut trees	n:										
Sweet potato	r:										
Taro	s:	1	0.026	1.00	5.0	119			119	24	
Yam	t:										
Pana	u:										

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	1.0			1.0	100		
Coconut	b:							
Cabbage	g:							
Banana	l:							
Nut trees	n:							
Sweet potato	r:							
Taro	s:	1.0			1.0	100		
Yam	t:							
Pana	u:							

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON THIRD WEEDING (per holding)

i) Total time worked

		mean holding area (ha)	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	work days total	labour cost (SI$)
Total	:	0.710	2			0			0	
Coconut	:	0.569								
Cabbage	:	0.002								
Banana	:	0.008								
Nut trees	:	0.004								
Sweet potato	:	0.050								
Taro	:	0.021	2			0			0	
Yam	:	0.017								
Pana	:	0.039								
Other		0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours men	work hours women	work hours paid	work days men	work days women	work days paid	% contribution to family labour men	% contribution to family labour women
Labour units available	1.41	1.67	1.00					
Total	2			0			100	
Coconut								
Cabbage								
Banana								
Nut trees								
Sweet potato								
Taro	2			0			100	
Yam								
Pana								

Derived from household composition labour availability
% contribution to family labour is derived from the table above

Table: A2.9
LABOUR OPERATIONS ON HARVESTING (per hectare)

		number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	labour input: per season: hours/ha: men	labour input: per season: hours/ha: women	labour input: per season: hours/ha: paid	labour input: per year: hours (hrs/ha)	labour input: per year: days (d/ha)	labour cost ($/ha/yr)
i) Labour input by main crop growing in the plot											
All plots summary	:	34	0.464	2.50	4.6	212	629		2103	458	
Coconut	b:	18	0.832	2.44	6.2	134	63		482	77	
Cabbage	g:										
Banana	l:										
Nut trees	n:										
Sweet potato	r:	7	0.041	3.43	2.9	546	1855		8232	2881	
Taro	s:	1	0.183	1.00	2.0	612			612	306	
Yam	t:	1	0.025	1.00	2.0		709		709	355	
Pana	u:	7	0.046	2.14	2.9	52	937		2119	742	

		average number of workers: men	average number of workers: women	average number of workers: paid	average number of workers: total	% contribution: men	% contribution: women	% contribution: paid
ii) Labour composition								
All plots summary	:	1.5	1.2		2.7	25	75	
Coconut	b:	2.7	0.9		3.6	68	32	
Cabbage	g:							
Banana	l:							
Nut trees	n:							
Sweet potato	r:	0.3	1.9		2.1	23	77	
Taro	s:	1.0			1.0	100		
Yam	t:		1.0		1.0		100	
Pana	u:	0.1	1.4		1.6	5	95	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.
2. "Hours per year" is the sum of hours per season multiplied by times per year.

LABOUR OPERATIONS ON HARVESTING (per holding)

i) Total time worked

	mean holding area (ha)	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	work days: total	labour cost (SIS)
Total :	0.710	297	496		71	159		229	
Coconut :	0.569	186	88		30	14		44	
Cabbage :	0.002								
Banana :	0.008								
Nut trees :	0.004								
Sweet potato :	0.050	94	318		33	111		144	
Taro :	0.021	13			6			6	
Yam :	0.017		12			6		6	
Pana :	0.039	4	78		2	27		29	
Other	0.000								

Derived from plot details aggregated over entire holding

ii) Time worked per labour unit

	work hours: men	work hours: women	work hours: paid	work days: men	work days: women	work days: paid	% contribution to family labour: men	% contribution to family labour: women
Labour units available	1.41	1.67	1.00					
Total	211	297		50	95		37	63
Coconut	132	52		21	8		63	32
Cabbage								
Banana								
Nut trees								
Sweet potato	66	190		23	67		23	77
Taro	9			5			100	
Yam		7			4			100
Pana	3	47		1	16		5	95

Derived from household composition labour availability
% contribution to family labour is derived from the table above

LAND CLEARANCE

Annual Labour per Holding

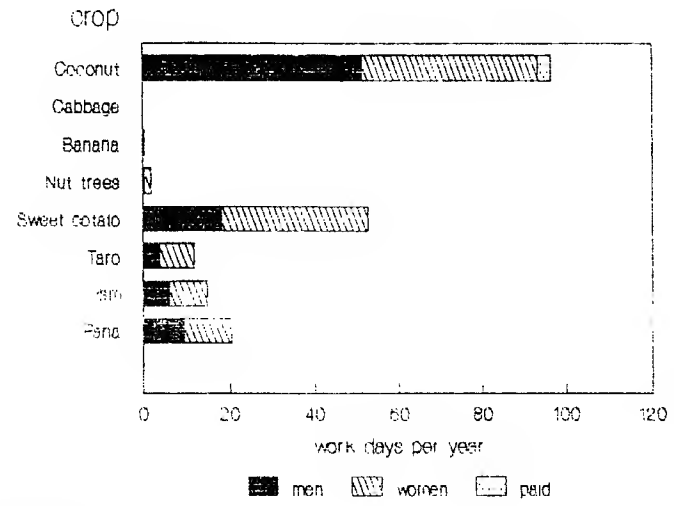


Diagram: A2.1

CULTIVATION

Annual Labour per Holding

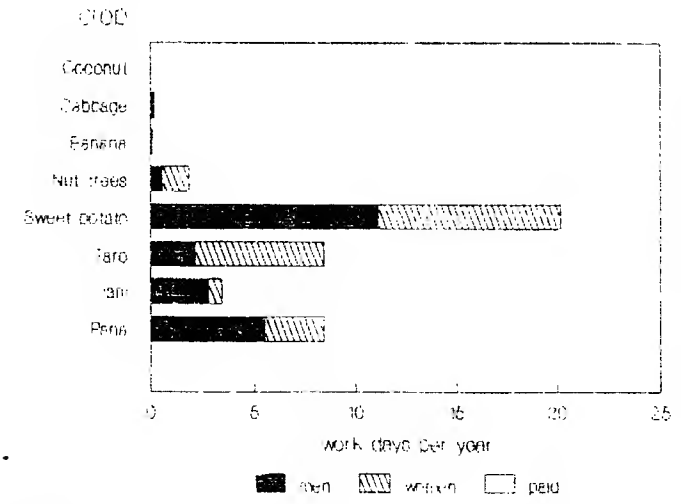


Diagram: A2.2

PLANTING

Annual Labour per Holding

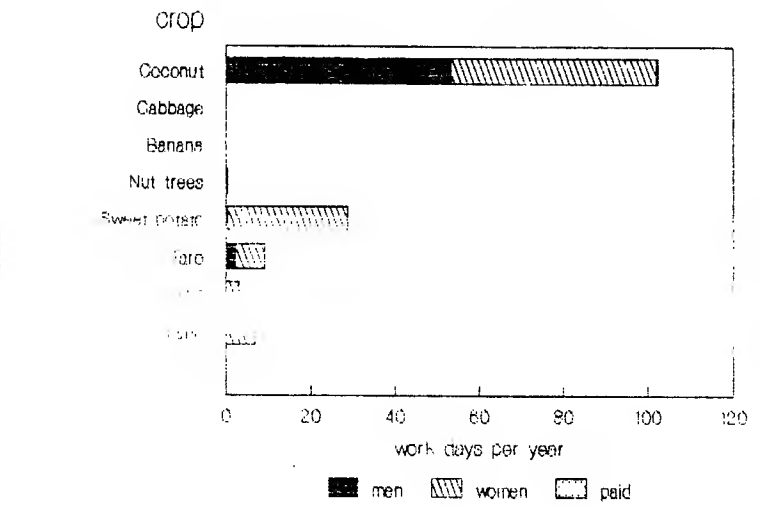


Diagram: A2.3

CROPS ESTABLISHMENT

Annual Labour per Holding

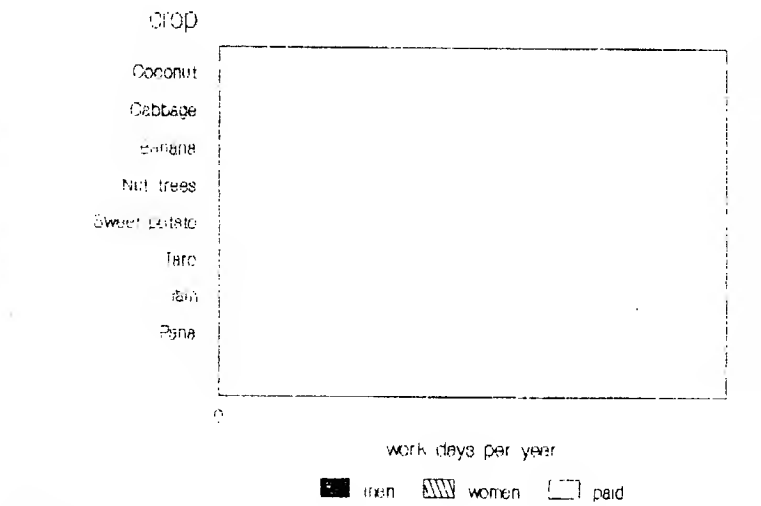


Diagram: A2.4

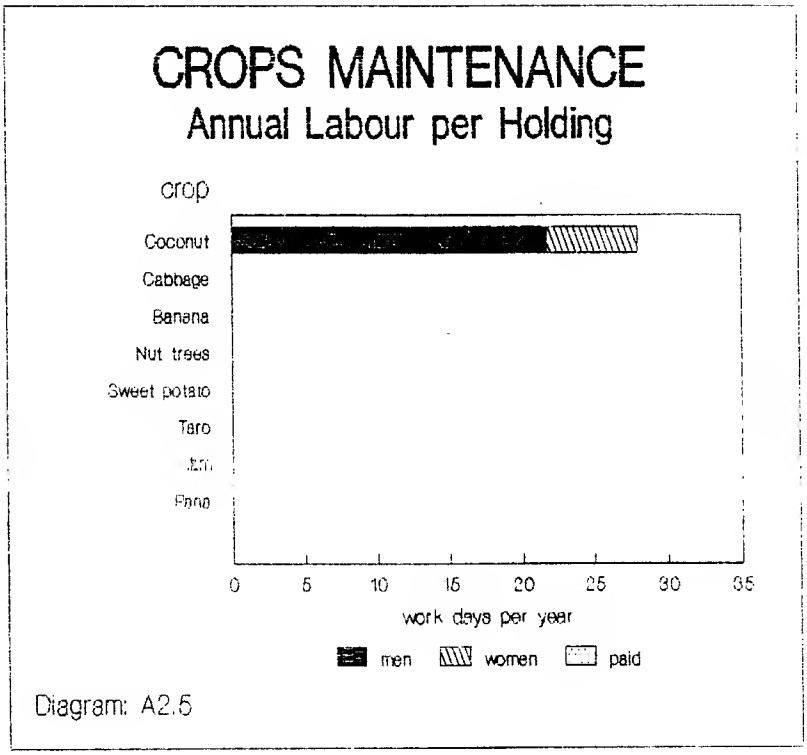


Diagram: A2.5

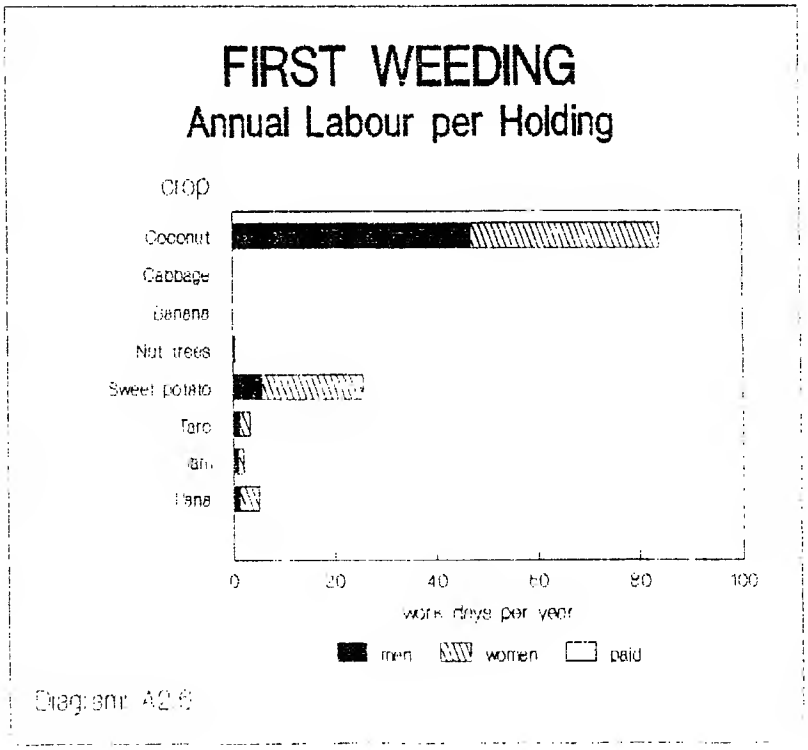


Diagram: A2.6

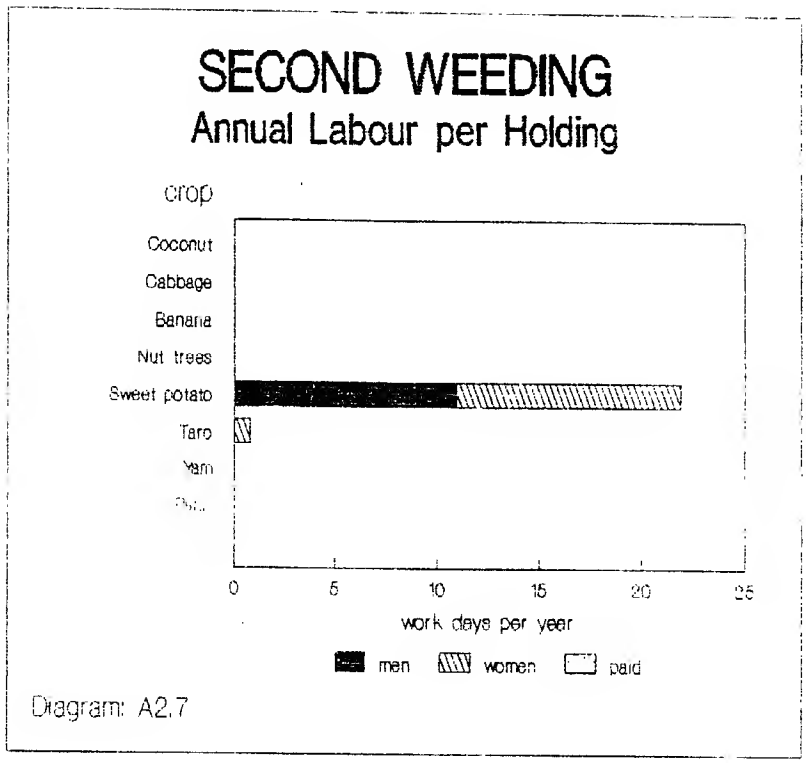


Diagram: A2.7

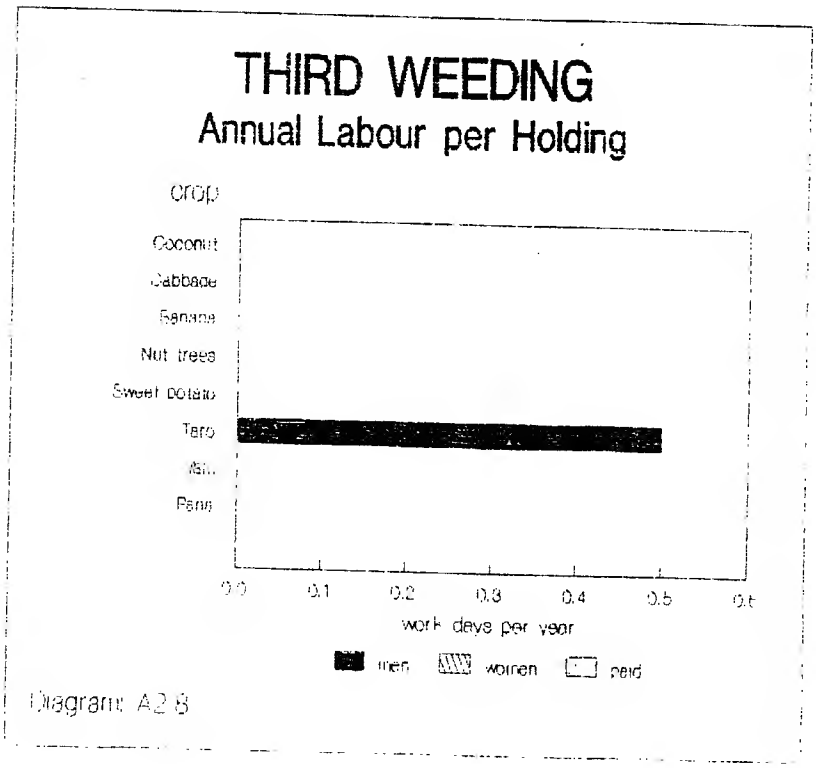


Diagram: A2.8

HARVESTING

Annual Labour per Holding

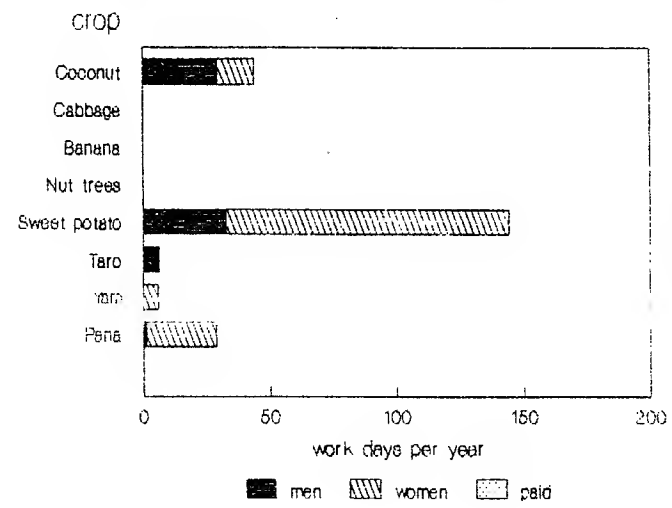


Diagram: A2.9

Annex: 3
CROP DAMAGE

A3.1 The following analysis of crop damage is based on observations of crop mixtures at the plot level. Tables show the dominant crop growing in the mixture, but damage encountered may refer to other crops in the plot. In the present analysis it is possible only to present results at the plot level, and not at the crop level.

Table: A3.1a
CROP DAMAGE DUE TO INSECTS - AFFECTING LEAVES

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		10	4			134	10	90
coconut	b		2			24	8	92
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r	3				46	7	93
taro	s	5	2			14	50	50
yam	t					10		100
pana	u	2				29	7	93

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area			11			11	89
coconut	b		14			14	86
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.1b
CROP DAMAGE DUE TO INSECTS - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		5	1			134	4	96
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r	1				46	2	98
taro	s	3	1			14	29	71
yam	t					10		100
pana	u	1				29	3	97

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.1c
CROP DAMAGE DUE TO INSECTS - AFFECTING ROOTS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		1	8		I	134	7	93
coconut	b				I	24		100
cabbage	g				I	1		100
vegetable	h				I	7		100
banana	l				I	1		100
nut trees	n				I	1		100
tobacco	q				I	1		100
sweet potato	r		1		I	46	2	98
taro	s		4		I	14	29	71
yam	t		1		I	10	10	90
pana	u	1	2		I	29	10	90

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area					I		100
coconut	b				I		100
cabbage	g				I		100
vegetable	h				I		100
banana	l				I		100
nut trees	n				I		100
tobacco	q				I		100
sweet potato	r				I		100
taro	s				I		100
yam	t				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a
CROP DAMAGE DUE TO DISEASE - AFFECTING LEAVES

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		6	3		5	134	10	90
coconut	b	2	3		5	24	42	58
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s	1				14	7	93
yam	t					10		100
pana	u	3				29	10	90

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		4	4		26	33	67
coconut	b	5	5		32	41	59
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a
CROP DAMAGE DUE TO DISEASE - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		3				134	2	98
coconut	b	1				24	4	96
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u	2				29	7	93

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2c
CROP DAMAGE DUE TO DISEASE - AFFECTING ROOTS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots						134		100
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u					29		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.3
CROP DAMAGE DUE TO HUMANS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		4				134	3	97
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u	4				29	14	86

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.4
CROP DAMAGE DUE TO FIRE

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		1				134	1	99
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u	1				29	3	97

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.5
CROP DAMAGE DUE TO FLOOD

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		2				134	1	99
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u	2				29	7	93

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.6
CROP DAMAGE DUE TO WIND
i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		3				134	2	98
coconut	b	1				24	4	96
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u	2				29	7	93

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		11				11	89
coconut	b	14				14	86
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.7
CROP DAMAGE DUE TO RATS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		9	5			134	10	90
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r	9	4			46	28	72
taro	s					14		100
yam	t					10		100
pana	u		1			29	3	97

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.8
CROP DAMAGE DUE TO BIRDS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		4	2			134	4	96
coconut	b	1				24	4	96
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r	1	1			46	4	96
taro	s					14		100
yam	t					10		100
pana	u	2	1			29	10	90

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		4				4	96
coconut	b	5				5	95
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.9
CROP DAMAGE DUE TO BATS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		2	2			134	3	97
coconut	b	1				24	4	96
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r		1			46	2	98
taro	s					14		100
yam	t					10		100
pana	u	1	1			29	7	93

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area		4				4	96
coconut	b	5				5	95
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.10
CROP DAMAGE DUE TO LIVESTOCK

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots		1			I 134		1	99
coconut	b				I 24			100
cabbage	g				I 1			100
vegetable	h				I 7			100
banana	l				I 1			100
nut trees	n				I 1			100
tobacco	q				I 1			100
sweet potato	r				I 46			100
taro	s	1			I 14		7	93
yam	t				I 10			100
pana	u				I 29			100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area					I		100
coconut	b				I		100
cabbage	g				I		100
vegetable	h				I		100
banana	l				I		100
nut trees	n				I		100
tobacco	q				I		100
sweet potato	r				I		100
taro	s				I		100
yam	t				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.11
CROP DAMAGE DUE TO OTHER FACTORS

i) Frequency of plots damaged

extent of damage:		little	consid-erable	severe	crop devastated	total # plots	% affected	% unaffected
all plots						134		100
coconut	b					24		100
cabbage	g					1		100
vegetable	h					7		100
banana	l					1		100
nut trees	n					1		100
tobacco	q					1		100
sweet potato	r					46		100
taro	s					14		100
yam	t					10		100
pana	u					29		100

ii) % crop area affected

extent of damage:		little	consid-erable	severe	crop devastated	% affected	% unaffected
% total cropped area							100
coconut	b						100
cabbage	g						100
vegetable	h						100
banana	l						100
nut trees	n						100
tobacco	q						100
sweet potato	r						100
taro	s						100
yam	t						100
pana	u						100

Note: The table of % area is only approximate due to rounding small numbers

Annex: 4
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